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ABSTRACT

This publication contains texts of papers presented at the National Research Coordinating Units Directors' Conference, which was attended by 65 participants representing Research Coordinating Units (RCU), state and federal education departments, universities, and other organizations. Presentations were: (1) "New Vistas in Research," by M. Essex which points out research developments and needs in vocational technical education, (2) "The Support Role of the RCU," by J. Moss, Jr. which emphasizes the RCU functions of research, development, and dissemination in supporting vocational education, (3) "RCU's: A Basis for Reassessment," by G. Swanson which discusses principles that can serve as a basis for RCU evaluation, (4) "Education Professions Development Act: Its Purposes, Process, and Needs," by C.H. Buzzell which provides insights into vocational education needs that assist in designing RCU support strategies, (5) "Methodology of Curriculum Development: Technical Education Research Center Electromechanical Project," by D.S. Phillips which reports a research and development project, and (6) "The Research Implications of Vocational Education for the Handicapped," by J.E. Williams which describes the role of RCU's in vocational education research for the handicapped. (SB)

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Vocational Research Coordinators Conference
Rice Hotel
Houston, Texas
Tuesday, April 7, 1970
9:30 a.m.

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NEW VISTAS IN RESEARCH

My modesty, on this occasion, should be quite evident. I am neither an academician nor a researcher. I am reminded of the quip that Sir Winston Churchill made about Clement Attlee after Attlee had become Prime Minister of Great Britain. An associate said to Churchill that, "Among Attlee's virtues, is the fact that he is a very modest man." Churchill replied that Attlee had no reason to be other than modest!

As a practitioner, I come before you in a similar posture today. Perhaps even more apropos is the response that the owner of the mongrel gave when asked why he had entered his cur in the Dog Show. He replied that he thought it would be nice for his dog to enjoy such high class company!

Recently, I had occasion to sit with a group of persons who were charged with the responsibility for planning the education component of the 1970 White House Conference on Children and Youth.

Not unlike others, particularly, along the Eastern Seaboard - they expressed the need for a fresh and broader approach to education - as they put it - a new paradigm for thinking about education. Such groups

invariably concern themselves with elements, such as (1) the nature of society, (2) the characteristics of human beings, and (3) our socializing institutions.

How does education deal with societal needs? Can we be more realistic - particularly, in the present climate - about how human beings learn? These factors, as a matter of course, should determine the posture of our socializing institutions.

One of the most encouraging themes that rises to a higher and higher crescendo is the urgency for more and improved research in education. Fortunately, the panorama of the research spectrum has more bright hues in it than at any time in the history of our country. The growth or magnitude of the present movement is evident by the fact that of all of the U.S. Office research funds in its entire history, 80% of the total has been appropriated in the last four years.

On occasion, I have returned from the Soviet Union dismayed at the lack of organized research in our country when compared with the Russian Academy of Pedagogical Science, with its 600 pedagogical scholars, buttressed by a sizable staff of technicians and clerical persons, making a total of 2000 or more engaged in educational research and development. Our research in this country - if it could be called "research" - has been done, in a large part, by graduate students, and some projects financed by foundation grants. Regrettably, it has lacked the comprehensive and longitudinal character that the complex learning process presents.

All too much of our research efforts of the past qualify for the term

which the intellectuals are using, "meritricous". The research had an appeal of merit for the moment, but was not sound, and hence, not meritorious. As a result, we have oversold and over-promised the capacity of education to perform in certain areas.

Over the weekend, I was sitting with the National Advisory Council for Educational Laboratories, which has also assumed the advisory role for R and D Centers. For the first time in the history of our country, we are building a network of research instrumentalities. You will recall that, in the mid-'50's, we had the first move at the federal level through the cooperative research concept. It was limited in funds and scope, but it was a start. The Elementary and Secondary Education Act of 1965 brought more substance and structure. You will recall that 20 regional laboratories were established. Later, we considered it necessary to close five of them.

Concurrently, the Research and Development Centers were established on university campuses. The project research concept was expanded, also. Simultaneously, and of great importance to education, was the establishment of the North Carolina and Ohio State Research Centers for Vocational and Technical Education. As you know, there is a new and encouraging proposal emerging from the foggy bottoms of the Potomac. It is the National Institute for Education, that could grow into something comparable to the mammoth National Institutes of Health research establishment.

The 1968 vocational amendments recognized the importance of providing some funds to the states for the purpose of research. As they say in this part of the country, "It's time to bite the bullet." Although funds

are not in the dimensions we consider necessary, there is now a new challenge of management and leadership.

When the regional laboratories and the R and D Centers were established, we were woefully short of researchers. There had been little demand for them. I am certain that such persons continue in short supply, but we have moved down the road a long way in the past four or five years.

How are we accepting the new demands? The new potential?

In my opinion - speaking relatively - we are advancing quite constructively. For example, the A.V.A. Journal recognizes the special character of research by the yellow insert in each edition. I note that the March issue, in which Bill Stevenson writes the guest editorial in the context of vocational research - "A COMING OF AGE" - illustrates a new high in the art of the vocational researcher and research. Certainly, the A.V.A., through its publications, is a vital agent in the dissemination process.

However, as one views our new state of progress, the decision to assign a special E.R.I.C. for vocational-technical education is equivalent to Neil Armstrong's "One Giant Leap for Mankind" on the surface of the moon. Here, for the first time, we bring together, in our most advanced scientific manner, the research reports in a central location for cataloging, storage, and retrieval.

I note that one of our eminent scholars in vocational-technical education, Rupert Evans, brought his family in his house trailer to Columbus last fall, and ensconced himself at the Center, while engaged in

the writing of a new monograph. As an aside, I must report that Rupert's plans were somewhat upset by an early blizzard in Ohio, and hence, he hitched up and departed. Nevertheless, it illustrates the potential of the vocational and technical Center and E.R.I.C.

May we view, for a moment, the meritorious aspects of including the state divisions of vocational education in the research funding from the federal government. I am certain that there are reservations in the minds of various persons about the direction that was taken. In chairing the National Advisory Study, I encountered sharply divergent points of view within the Office of Education and among the state directors of vocational education. In fact, this was one of the most heated issues that confronted us.

Several of the top researchers of the country joined the research persons in O.E. to plead for a unified concentration of the research funds at one point. These persons were of the opinion that the money would be dribbled out in small amounts to the various states and that little or no significant research of the in-depth and longitudinal type would emerge. The researchers preferred the major grant kind of studies. The state directors insisted, with equal determination, that they needed funds to carry on the gathering of data for management decisions and to initiate and evaluate the innovative kinds of projects which would be useful in the indigenous background of the various states. Ultimately, the decision to share with the states was made.

After the Congress acted on appropriations a few months ago, I recall that Grant Venn commented most favorably to me, stating that this was a

wise decision which garnered the support which motivated the Congress to provide more funds for vocational-technical research than they would have otherwise. In other words, the practicality of the decision could not be ignored.

Certain decisions confront us in the structure or management of research that appear to warrant discussion in groups such as this one.

There is some thinking in the National Advisory Boards that the regional laboratories should be permanent establishments on an institutionalized basis. The same persons are of the opinion that the R and D Center status should be funded and evaluated on the project grant basis. The major difference being that the R and D's have an institutional base by being located on a university campus.

The institutional versus the project idea is one to which scholars and researchers should turn their attention. Whereas I am not directly connected with the Center at the Ohio State University, the university has seen fit to construct buildings - rather sizable ones - for the housing of the Center - which are specially designed for this function. Should this be institutionalized, or should it be on a project basis? I am inclined to think that it should be institutionalized.

If you have not done so, I would urge you to review the January, 1970 Centergram that was published by the Center for Vocational and Technical Education at the Ohio State University. This four-page statement, entitled, "An Open Letter to the Vocational-Technical Education Community", reviews the objectives of the Center, dealing primarily with priorities and

selectivity of effort. The areas of emphasis take on terms such as these: "Leverage", "Relevance", and "Non-Duplication". The report exhibits the Center's concern in six major program areas for a greater programmatic effort. At the top of the list is "State Leadership". The second concerns the very essential factor of Teacher Education. The third deals with Curriculum Development. In the fourth, expression is directed to a concern for the Occupationally Disadvantaged. Of course, the objectives include the Change Process. This document itself illustrates a new maturity of development which is reassuring. In addition, it illustrates the urgency for the continuity of vocational R and D Centers.

I am not knowledgeable about developments at the North Carolina Center, but I am firmly of the opinion that there should be more than one Center.

Without the concept of continuity - which brings to the fore the uncertainty of funding - the Centers would be harmed by the inability to attract people with a career concept for R and D.

Bill Stevenson most graciously offered some suggestions for emphasis on this occasion. One was a picture of an effective research design for a state program of vocational education. The immediate question that I have faced, and I assume that it is not unusual in the other states, is the extent of in-house staffing versus outside contracting. Another decision which confronts management in this area is the acquisition of a data processing facility. A third element is in the balance of in-house projection of objectives as related to the lay advisory council function.

Our experiences to date lead to the conclusion that a small staff - but large, compared to all the other functions in the State Department of

Education - consisting of a half-dozen or so professional persons - should be engrossed full time in gathering baseline data for management decisions, the preparation of reports for dissemination, and the exploration of new or potentially innovative ideas that may be emerging elsewhere in the country or the world. The latter requires participation in conferences, access to the literature, and time for brainstorming of ideas with the practitioners, both within the Department and in the field.

The Research section of the Division of Vocational Education must not be in the mainstream of day-to-day managerial decisions. These persons must, however, be closely attuned to the gathering of information for these decisions. Certainly, one of these persons should be knowledgeable in the design for the "stuff" that goes into the computer.

The weakness of the computer in the research and management areas rests largely in the short supply of individuals who know how to frame the questions or the design for programming. A vocational researcher must be both knowledgeable in the terminology or "jargon" of vocational and technical education, and the computer language, in order to provide the appropriate communications. His intellectual armor must include also an understanding of the terminology of the researcher, including its perimeters and capacities. In addition, an economist must be a part of the research staff so that his knowledge of the economic developments can be a part of the input.

Bill also raised this important question - "How may vocational research be made more relevant to the needs of vocational education?"

Some of the research must be close to the scene of action. This is the reason for allocating funds to the states. There is also a need for the research to be closely attuned to regional development in science and industry.

Concurrently, however, there must be far-out, high-risk research relating to innovation. This kind of research logically emanates from the foundation grants and federal funding. Here is where the national brainstorming should take place, and where we should be willing to make the risk capital available.

The role of research in the Change Process is an exciting area that warrants the researcher's interest. The words, "Change Process", have been used until they have lost some meaning. Nevertheless, the process of moving from one curriculum to another, closing out an occupation and beginning the instruction in another, and the like, warrant a well conceived process or processes which the administrator and teacher-educator can employ. One cannot over-stress the need for a sound and well understood operating process for the Change Process.

I have not attempted to define research in its narrow dimensions. Rather, I believe strongly in a concept that a mix of basic research, risk development, demonstration, and dissemination will bring the best output.

Perhaps an effort should be made to prepare a "laundry list" of the kinds of research-related functions which can be done best by state departments and local school districts. Certainly, the orchestration of this effort should be in close harmony with projections of the economists, trends in industry, and the budding potentials that emerge in pure science research. Those which have the far-reaching impact on methodology,

organization for instruction and materials development appear to have a more propitious setting in the foundation and O.E. grant areas.

Perhaps you will have apprehensions about my next recommendation.

The rapidity of change in vocational preparation and the need for retraining for vocational adequacy lead me to the conclusion that we need to establish centers for the development of instructional materials - teacher guides, work sheets, diagrams, or what have you.

The commercial publisher cannot be assured of the volume of sales that would permit him to engage in the necessary developmental investment, plus the cost of publication and distribution. Hence, in this area, we need Centers which will work continuously on two functions, (1) the design of materials, and (2) the design of inservice programming. Stated differently, we need to institutionalize curriculum development and inservice education. The latter is shamefully sporadic and disgracefully unorganized. There is need for the annual production of inservice materials that will serve the local school district or the region, and that will exhibit both new organization or methodology and the new knowledge or changes in the job world. In addition, the program for the first-year teacher certainly should not be the same as the program for the more experienced teacher. This production center should be a responsibility of the state agency.

Returning to the development of instructional guides and student texts, this process should be under way the year around, so that new and supplemental publications would be available to teachers as changes occur. As stated earlier, the investment required may be prohibitive for the private publisher. This

kind of materials development needs to be subsidized in the national interest. Centers will be required - national and regional. It may well be that one state department could establish a cooperatively developed Center that would serve others in the region, or others in the nation, where materials are applicable. The vocational-technical Centers could be a national instrumentality.

Truly, there are new vistas in research. For the first time, we are moving toward a comprehensive national structure. We are giving research an institutionalized life rather than the frenzied-"Perils of Pauline" - cliff-hanging fund traumas of the project concept. Researchers are being developed because we have research going forward and people who have been trained are now learning their profession. The U.S. Office has brought together, under a Deputy Commissioner, the vast and growing areas of planning, research, and evaluation. We are establishing research instrumentalities within the departments of education. The federal funding has been a boon - an essential. The fact of this group - your being in a national meeting - is a salutary and substantive development of no small proportion.

The design of the research and development centers and their continuity, particularly, those concerned with vocational and technical education, the establishment of a clearing house - E.R.I.C. - for vocational-technical - are new galaxies in the constellation of advancement.

Whereas there are sharp differences of opinion, there is some evidence of more recognition of the importance of correlating, integrating, and associating vocational-technical comprehensively with the total program of education rather than the tendency toward separatism in the manner of the

Smith-Hughes concept. If this development continues, it will be a hallmark of maturity in American education.

The goals or foci of emphasis are relating more and more to the societal need for blunting and reversing the growing and near-malignant welfare syndrome. If vocational education is to come of age and is to be embraced with national approval, it must relate to the nature of society, the character of human beings, and to the design of our socializing institutions.

This means, in our time, that vocational education is concerned with sustaining the economy - in providing a supply of skilled manpower. On the other hand - and far more compelling in its emotional and substantive elements - is the national emergency to deal with the ever-growing numbers of youngsters who are reared on the welfare check, who do not find private employment emanating from their homes or in their community surroundings. Permit me to illustrate:

Some months ago, when I was on the eastern seaboard presenting awards to teachers who had developed exemplary projects in economic education - \$500 awards to 15 persons - an attractive black girl arose to give her report. She said: "I teach first grade in Magnolia, Arkansas. The name of my project is 'My Father Doesn't Work. He Gets a Check.'"

She said, "We wanted to have our children, the six-year olds, know that children grow up to work, and in return for work, they receive goods and services. In the circle of first graders, I asked one little girl, 'What does your father do?' She replied, 'My father doesn't work. He gets a check.'" As the teacher went around the class, she found a sizable number who gave the same answer.

Even though I had lived closely with it, I hadn't realized the appalling character of the welfare cycle in this third generation. Each of us grew up with an example of someone going off to work; we simply assumed that we would go to work. We did not think about it. We did not rationalize it. We saw it daily and expected to prepare for it.

But there is a world in which youngsters do not see people go off to work; they see them receive a check. They do not see private employment in their community; they see crime and how it pays. They see numbers writers who are the most prosperous men in the neighborhood. They see the prostitute. They think little of it because it is their world.

When the teacher tries to explain to these youngsters the Lincoln ideal that "I will prepare and my opportunity will come", she encounters disbelieving expressions. When she emphasizes the route of honesty and hard work that traditionally lead to the attainment of the "American Dream", the youngsters wonder where she got lost. It isn't the world they know. Hence, a redesign of education, including a strong component of vocational education, earlier part-time work experiences, and an adjusted curriculum, are a part of the challenge.

To me, this means that we should move more rapidly in the research of developing instructional materials for youngsters at an early age so that they may understand the economy and their work world; in addition, we must make known and prove through research and demonstration, that greater numbers of our young people should be in school part time and in work experiences part time. The cooperative is successful. This means a change in our economy. It means subsidizing industry for this vital purpose.

This appears to be the only way that we can make America whole again.

Permit me to mention, in closing, the vast potential of differentiated teaching roles. This is not the occasion to speak of my Executive Teacher Plan. Needless to say, I have great faith in it. The differentiated use of teaching manpower has more applicability in vocational-technical education than any other part of the school operation.

As a practitioner, I would not presume to pose as a researcher, but rather, to attempt to give emphasis to the broad issues and the vast potential of vocational-technical education in our time, and to urge that we stop filling the pool with potential unemployables. We should permit this alienated, hostile, and embittered mass of our fellow young Americans to be a part of the "American Dream". A properly designed vocational-technical program is the only answer.

I am genuinely reassured and exhilarated by the fact of your assembly here, because of your vital place in the advancement of the country. I hope you will pursue vocational-technical research as a great adventure. Happy hunting!

THE SUPPORT ROLE OF THE RCU

Jerry Moss, Jr.

I am finding it increasingly useful to view vocational education as a system. It takes as input students with various characteristics and as output it attempts to produce graduates who will fill society's need for trained manpower and who will be satisfied, satisfactory workers.

In order to accomplish this mission, the vocational education system has to perform certain functions. It guides, selects, instructs, supervises, manages, places, and so forth.

The functions of the vocational systems in each of our states are essentially the same since the states have very similar inputs and have adopted reasonably common desired outputs. What does differ among states, however, is the manner and extent to which we choose to carry out the various functions, and the manner in which we choose to package or administer them. Some states, for example, package the instructional function primarily in comprehensive institutions, others have adopted specialized schools; some states provide in-service trade and industrial teacher education primarily through employees of the State Department of Education while others make greater use of existing teacher education institutions, and so forth. All states are constantly looking for the most efficient ways and means of performing the required functions.

Within the past several years, federal legislation has called the states' attention to several functions which they might have been overlooking or underemphasizing. I say "might have been" because all states had not been giving equal attention to them nor would they now all agree upon the

attention they deserve in the context of carrying out the total mission of their respective vocational systems. I refer, of course, to the functions of planning, evaluating, researching, developing, and diffusing. Not only are states being required to re-examine the relative importance of these functions, but they are being asked to determine how they can best be carried out and how they can be packaged or administered most efficiently.

My first and primary concern is that the real significance of those functions be fully recognized for their intrinsic value to the vocational education system.

Planning is important because the time has passed when funds can be secured for vocational programs on the basis of "last year's budget." The competition for the dollar is too great, legislators are too sophisticated, and I trust our consciences are too sensitive to permit us to "fly blind" any longer. We must be able to see where we are going and to justify the direction and rate of movement. And this requires information upon which to make reasoned management decisions.

Evaluating is inextricable from planning. We must know what has been accomplished, and how well, in order to permit us to plan intelligently for change and progress.

Researching and developing provide the knowledge and the products that make possible qualitative improvements in performance - that make possible increases in system efficiency. Vocational education is beginning to take on new responsibilities. The scope of our input - the range of student abilities, aptitudes and ages with which we are concerned is widening; the nature of our purposes is gaining breadth; the diversity of occupational demands we are being asked to satisfy is growing and becoming more complex.

In short, we not only have our "old" problems, but new ones are being created by the assumption of new responsibilities. Research and development are the best tools available with which to solve these problems.

And the diffusing function is the means by which problem solutions - proven innovations and improvements - can be adopted by and regularized in the vocational system.

Together, planning, evaluating, researching, developing and diffusing spell out the end of the "flying by the seat of our pants" era; they impel us to provide the means by which vocational education can "go on instruments." They permit us to fit vocational education more effectively into the larger social and economic system of which it is a part. In the sense that none of these functions involve direct contact with students they may be considered "supportive." But, I think they are absolutely essential to the survival of the public school vocational education program.

Since I also think that most of the people at this meeting agree with me, I'll push on to a more debatable question: How should these functions be organized (packaged) at the state level for effective conduct in existing vocational systems?

There are four kinds of criteria that might be used in deciding how to organize the functions in a given state; two of them speak to the question of desirability, while the other two take into account feasibility or existing constraints.

First, it is desirable to assign compatible functions to a given organizational unit and then to place each unit in the organizational hierarchy next to the units that relate to it most directly. In this way the kinds of activities required to conduct the functions within one unit can be mutually reinforcing, and may even be carried out by the same personnel, and so that

the output of each unit can be transmitted as input to the proper related unit with minimum interference. With this criterion in mind, consider the planning, evaluating, researching, developing and diffusing functions. Planning and evaluating call for proceduralized, regularized, continuous kinds of activities designed to "steer" the vocational system. They require data collection, but it is mainly the same kind of data, gathered over and over again. Planning and evaluating exchange outputs and they both provide direct regular inputs for the conduct of the managing and operating functions. Contrast this with the conduct of the researching and developing functions, whose purpose is to change the system - to provide new ways to plan and evaluate, to provide different improved operational techniques - to temporarily upset parts of the system. Research and development activities are not regularized or continuous; rather they are intermittent on a program or project basis. Nor is the data they collect similar from one project to the next. While research and development activities (of an innovative nature) are quite similar and their results often provide inputs for each other, the use of their output by planning, managing, evaluating and operating is quite irregular. In fact, while planning and evaluating benefit from, even require, close association with managing and operating, researching and developing tend to flourish in a less directive, urgent environment - an environment which provides for maximum exposure to new ideas, varied sources of information, and expertise in all the manpower and educational fields. This is not to say that vocational research and development should be detached from the realities of the vocational program; research and development activities must attack the persistent problems of the practitioner. It does say, though, that researchers and developers should be sufficiently removed from everyday pressures for immediate action and conformity to

permit a more objective, critical appraisal of the vocational program and to provide a greater opportunity for exposure to varied ideas. Thus, on the criterion of compatability of functions, as it might be applied to state-level organization, it is desirable to place planning and evaluating close to each other and to management and operations. Researching and developing, on the other hand, can be combined, but they will probably contribute more to the system in the long run by being kept a greater administrative (and even geographical) distance from the day to day decision-making, operating apparatus.

When the criterion of compatability of function is applied to diffusing, the results are ambiguous. As one part of diffusion, the dissemination of new knowledge to practitioners can best be done by people who have freest access to that knowledge and who are qualified to judge its validity and synthesize it for meaningful consumption. This calls for high-level research competencies and can often be partially accomplished as one step in the conduct of a research or development project. But the conduct of demonstration projects, as a second part of the diffusion function, should be under the direction of operational personnel at the state level. This presumes that some innovative development has already been shown to have reasonable merit and that program managers find it relevant to their purposes and wish to propagate the idea within the state. It is then a matter of further trial and promotion, which can be handled most expeditiously by those who have the program operation responsibility and who can utilize special financial incentives to speed implementation.

The second criterion that can be applied to determine the appropriate organizational structure at the state level for carrying out system functions is of relative importance. The more important the function the higher it

belongs in the organizational hierarchy and the greater the proportion of requested resources that are usually allocated to it. Planning and evaluating should have equal status with program operating in state-level organizational hierarchies. The importance attached to researching, developing and diffusing is too frequently a reflection of the State Directors present satisfaction with the scope and quality of the existing program. Under some circumstances his satisfaction is directly related to the outside pressures for change being brought to bear on him. Unfortunately, the desire or pressure for change has rarely been great enough or persistent enough, or the investment risk has been considered too great, to result in an adequate or a consistent state allocation for research, development and diffusion. In most states, the extent of the federal appropriation completely dictates the extent of these activities. And the erratic nature of federal appropriations has resulted in great irregularity of effort. The consequences have been serious. Instead of being provided a stable place in the state organization that permits direct, easy access (in a staff capacity) to top-level management and to all the other functions which they might serve, research, development and diffusion have been treated as an appendage, born out of wedlock, that gets placed wherever it is momentarily most convenient. They are then subject to all the buffeting and shifts of the changing winds of federal fortune. Further, the sudden stops and starts in funding are no more efficient for the conduct of these functions than stops and starts are for the gas mileage of your car.

The final two criteria used to determine the state level organizational package for the planning, evaluating, researching, developing and diffusing functions are related to the questions of feasibility and practicality. In a real sense the two criteria can be considered constraints placed upon

what seems most desirable. By applying these two criteria, what "should be" gets interpreted as what "can be done now without too many problems." I refer, first, to the criterion of the existing organizational pattern and interrelationships, and the problems entailed in upsetting the existing structure. This is closely related to the second criterion which is concerned with the present organizational location of suitable personnel. If we have a man in Unit A whom we think can oversee the conduct of new functions, the tendency is to just assign them to him in Unit A and avoid any messy problems of organizational and/or personnel changes. Different organizational patterns will almost inevitably occur among states, even when they begin with similar perceptions of what is most desirable, because the constraints each is operating under, and which must be taken into account, are different.

In summary, how can this rather abstract discussion of functions be applied to the support role of the RCU? If the name of an organization is to be at all related to its functions, the RCU label should be given to the organization responsible for research, development and dissemination. Under research I exclude the routine types of data collection needed to provide normative information for receiving management decisions. Under development I include the creation and testing of innovative programs and instructional materials. And under dissemination I exclude the operation of demonstration projects designed to promote the use of specific instructional packages throughout the State. In other words, RCU's should administer Part C and most of Part D funds. Whether RCU personnel actually engage in the conduct of research and development projects or whether they devote their entire efforts to stimulating, facilitating and coordinating the R & D activities of others is dependent upon the extent of available

financial and human resources. The more money available, the more stimulating, facilitating and coordinating needed; the more limited the qualified R & D manpower, the more reasonable it is for RCU personnel to carry out the important and complex projects needed in the state.

Finally, the RCU should be kept administratively separate, whenever possible, from the units assigned to perform planning and evaluating. And in order to maximize the likelihood of making significant long range impacts upon the quality of the vocational education program, the RCU should be kept as free as possible from the day-to-day concerns of the operating program. The RCU is a part, a potentially very important part, of the vocational system. It must maintain its contacts with the rest of the units in the system; it must devote its energies to the improvement of the system in ways seen reasonable and important to other vocational personnel. But to perform its job most effectively it must operate on the fringes of the system where it has maximum exposure to new ideas from sources outside of, as well as inside, vocational education, and where it has reasonable freedom to experiment with and test innovations that are consistent with overall system purposes.

Business and industry have long since shown the high rate of return that is possible from long range investments in research and development. They don't encumber their R & D units with other competing functions, nor do they attempt to relate them too closely to production, quality control or accounting.

Vocational education is big business. When are we going to start acting like other successful big businesses?

R.C.U.'S - A BASIS FOR ASSESSMENT

by

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Background

The creation of a national network of Research Coordinating Units in the mid-sixties was a part of a widespread national movement to find new ways to place more reliance on research in education. It began in 1963 with the Research and Development Program established under the Cooperative Research Act, a program which resulted in the funding of nine R&D Centers from among almost 50 applicants. Following the passage of the Elementary and Secondary Education Act of 1965, a network of Regional Educational Laboratories was created to complement the role of the R&D Centers and to hasten the implementation of research in education. The nine R&D Centers were university based, but the Regional Laboratories were rather deliberately designed to operate on neutral ground; they were established outside of the aegis of either universities or state departments of education.

The effort to institutionalize research in vocational and technical education began at about the same time. It was motivated by a recognition of similar needs. Two R&D Centers came into existence; one at Ohio State University, whose origin predated the Vocational Act of 1963, and the other at the North Carolina State University whose origin post-dated the Vocational Act of 1963. The creation of the two R&D Centers for vocational education increased to eleven the number of national R&D Centers.

The use of federal funds to create Research Coordinating Units was authorized in April, 1965 when the Commissioner of Education invited each State Agency to submit proposals for their establishment. By the end of the fiscal year, nearly

half of the states had taken steps to create an RCU, and by the end of 1966, nearly all of the states had a unit or plans to establish one.

What were the motivating forces which stimulated the creation of Centers, Laboratories, and Research Coordinating Units during the mid-sixties?

First, it was recognized that education had a low capacity for generating new knowledge, that the instrumentalities for generating new knowledge were weak and underdeveloped, and that there were fragile linkages between research, development and practice. Research undertaken as projects by individual researchers was valuable and necessary, but it was not sufficient to create a reliable flow of new knowledge for the field of education.

Second, it was recognized that the nation's largest public service enterprises, such as agriculture, medicine, and defense, were relying heavily on a flow of new knowledge made available by governmentally financed research and development at billion dollar levels, and operating within a great variety of government sponsored research centers, laboratories, clinics and experiment stations. As a fully acknowledged public interest enterprise, education was finally being permitted to establish similar knowledge producing capability.

Third, there was a recognition of the fact that there were few, if any, models of research and development which were readily applicable to the field of education. The field itself was recognized as being highly complex and crucially in need of incorporating new knowledge into institutional structures, technologies, materials and training programs. As a field, education had no models of programmatic research and development which had demonstrated a capability for system-wide intervention in educational practice.

The creation of Research Coordination Units was a part of this search for new ways to institutionalize research in education. Leadership for their

creation arose within the U.S. Office of Education in consultation with numerous individuals in the field of vocational education. During their early years, they have faced problems which parallel those encountered by all of the R&D Centers and the Regional Laboratories. In addition, they have faced some problems which are unique within the field of vocational education.

The Context of RCU Development

With a few exceptions, all of the R&D Centers, Regional Laboratories and Research Coordination Units have gone through a period of reassessment and redefinition of purpose and function. Most of the R&D Centers began by defining a mission that was too broad for concentrated or focused research efforts. Most of them have now completed a review of mission and have begun to concentrate within a narrower frame of reference and one which is more consistent with the scholarly resources available to them.

The R&D Centers began with an intent to focus on research, development and dissemination. They discovered that effective dissemination was not easily accomplished in university centers, and they were rescued, in due course, by the establishment of the Regional Laboratories, whose primary function was dissemination.

A major problem in most of the R&D Centers was the need to focus on an institutionalized, programmatic intent rather than on a series of individual projects which, hopefully might cumulate and contribute to an overall mission. A programmatic intent, rather than its episodic counterpart, was a necessary choice in all R&D Centers. One institution chose to abandon its institutional funding and to move completely toward project support. Another center chose to abandon its R&D function and to become a Regional Laboratory. A third one has ceased to function due to a variety of reasons, including lack of institutional commitment.

Structural and administrative changes have also occurred in most of the R&D Centers, Regional Laboratories, and Research Coordinating Units. More than half of the R&D Centers have changed directors since their establishment. Most of the Regional Laboratories have revised their program functions since they were created, and four of them have now ceased to exist.

This brief review of the developmental history of R&D Centers and Regional Laboratories permits several observations about the research-development-dissemination emphasis which began in the mid-sixties:

1. First, there doesn't seem to be any normative pattern or natural trajectory in the creation of a research-development-dissemination chain in education. In the establishment of goals, objectives, and implementation-functions within an institutional setting, there is no "par" for the course.
2. Second, the mid-sixty intent to create knowledge-producing and implementing mechanisms for education has not been realized, but a number of modestly successful Centers, Laboratories and Research Units have been created. Their promise for contributing to program-matic research is enormous.
3. Third, the greatest added-value to education is provided by research enterprises with a capacity to modify goals to mobilize staff in accordance with evolving and dynamic institutional change, in addition to the need for research intervention in the educational process.

Each of the foregoing observations have applicability to R&D Centers in general, but there are further, and more specific, observations that can be made about the Research Coordination Units.

1. There is an unfortunate implied limitation in the reference to the Units as "Coordination" Units. The implication is that research,

development and dissemination is underway, and that a coordination function is essential but inadequate in each state. Actually the Research Coordinating Units can measure up to expectations only if they operate along the full continuum of research, development and dissemination. The word "Coordination" is an unfortunate misnomer if it is taken to prescribe or to proscribe the functional limits of the Coordination Units.

2. Coordination Units have discovered that new knowledge ordinarily becomes available in very small increments, and that there is no backlog of research evidence waiting to be disseminated to an eagerly awaiting constituency. Moreover, there are few new or dramatic research tools with unique applicability to vocational education, and there are few new technologies awaiting application in vocational education. The research-development-dissemination chain is most effective if viewed as a single entity, rather than as independent functions to be undertaken by separate or independent agencies.
3. The dismantling of the categorical structure of vocational education by permissive legislation in 1963 and in 1968 has introduced serious anomalies in efforts to carry on practitioner-oriented vocational research and development. Almost all of the practitioners in vocational research and development. Almost all of the practitioners in vocational education are employed as specialists in one of the categorically-oriented fields of vocational education as provided under enabling legislation established prior to the 1960's. Research and development conceived as a system of intervention for the improvement of current practice must necessarily take into account

the nature of current practice and its need for modification. Its need for modification is not seen by school people as the need for abandonment of the specializations within which they work. Accordingly, the anomaly continues; should the RCU work closely with school-based problems and categorically oriented practitioners, or should it concentrate on problems which tend to avoid the categorical and specialized nature of school practice.

4. Research Coordinating Units have been established in Universities, as well as in State Education Agencies. Satisfactory arrangements for administration and operation have been realized in either setting. Unsatisfactory arrangements have likewise been realized in either setting.

Ordinarily, one would expect a university setting to be ideal for research and development. But idealism is not sufficient. Universities also have a tendency to pursue the discovery of new knowledge for which there is little demand, and to let new knowledge find its own application through obscure publication or teaching. Universities also have a tendency to pursue research questions as though there were no sense of urgency about the solution to problems. Moreover, the incentive and reward system of the usual university setting is more closely linked with project-oriented research within limited time-frames than it is to the programmatic activities of a research-development-dissemination sequence.

State Education Agencies also have some traditional limitations in their capacity to operate research and development functions. First, and most important, is the fact that they find that it is much easier to fund other entities than themselves. It is traditional,

and almost axiomatic, for state agencies to be too overcommitted and too understaffed to carry out even the ordinary and usual functions of state leadership. Secondly, state agencies ordinarily find it easier to plan, administer and to evaluate vocational programs than to operate them in an institutional setting. It is more difficult, finally, for state agencies to expand or contract research activities in response to urgent or immediate needs than it is to be similarly responsive within a university. The nature of government employment often includes delaying difficulties in recruitment and employment.

5. The nature and function of Research Coordinating Unit operation requires an eventual commitment of state resources and a vital linkage with the State Plan program of vocational education. It is the only institutionalized function of the Nation's research-development-dissemination chain which includes statutory provisions for system-wide intervention through research (Vocational Amendments of 1968). Some states have exercised options for demonstrating unusual leadership in this regard, and all states have this challenge and opportunity available to them.

Previous Evaluations

Although no Research Coordination Unit has been operating for more than four years, the program represented in their combined efforts has undergone two evaluations. The first was done in 1967 by the Special Subcommittee on Education of the House Committee on Education and Labor (89th Congress) as a part of their study of the U.S. Office of Education.

In its general observations concerning the dimension of Adult and Vocational Research, the Subcommittee had the following to say:

The subcommittee views with great favor the establishment of research coordinating units in or associated with State Departments of education. In one sense, the purposes of the coordinating units is broad, in that they will be identifying, conducting, coordinating, and disseminating the results of research studies. At the same time, however, it can be said that they are quite limited in that their focus will only be on vocational and technical education. Thus far, units have been established in 44 States. Generally, they are funded at a level of \$200,000 over a 3-year period. Many of the State departments of education have limited resources to carry on research and development programs. This relatively small program should assist in providing considerable focus and support to State efforts for improved services in this area.

In their general recommendations regarding the entire Bureau of Research, the Subcommittee gave six recommendations. Following is the recommendation involving R&D Centers, Regional Laboratories and Research Coordination Units:

Immediate attention should be given to a clarification of the missions and responsibilities of the regional educational laboratories, the R. and D. Centers, the title III supplemental centers, and any other regional units which affect educational research. Office of Education policies regarding salaries for laboratory and center staffs should be reevaluated in terms of local salary schedules and manpower needs of State and local educational agencies. Reporting requirements of the Bureau for laboratories and centers should be reevaluated in terms of the missions and responsibilities to be defined. Consideration should be given to expanding the program providing support for research coordinating units in State Departments of education in terms of increased funding and broadened responsibilities for the units.

A second and more well known evaluation took place in 1969, an evaluation undertaken by a Task Force which resulted in the publication, Research Coordination Unit Program Evaluation.* The evaluation was accomplished by a mailed questionnaire and by conducting seven case studies, each involving an R.C.U. The Task Force was chaired by Dr. Keith Goldhammer of the University of Oregon.

*Final Report: Project No. 80232. Bureau of Research, Department of H.E.W. (Keith Goldhammer, Chairman).

The Report listed a series of 22 recommendations and 15 conclusions, which were based on the following summary:

1. Research Coordination Units were caught in three dilemmas:
 - whether to focus on research or development
 - whether to organize in a University or a state education agency
 - whether to respond to the need for overall vocational development, or the "traditional fragmentation" of vocational education
2. Field personnel were not generally involved in the management and goal establishment of Research Coordination Units. Moreover, advisory councils were used inadequately, even though they were found rather frequently.
3. R.C.U. Directors were not prepared to assume a dual leadership role for research on one hand, and occupational education on the other.
4. The RCUs had been modestly successful in their "clearing house" functions as information centers, and also in their attempts to focus attention on research needs in vocational education.
5. RCUs had failed in one of their primary missions, namely, to relate themselves to local programs of vocational education.

In general, this second evaluation took a curiously pathological approach to evaluation. It was antiseptically diagnostic, but it volunteered no judgment about whether the patient's life was worth saving. It took no account of the transitional norms encountered by all educational R&D efforts in the United States, the values as well as the difficulties inherent in the diversity which resulted from maximizing state options with respect to organization and goals and, finally, the promise and potential of an experimenting approach to statewide research intervention into vocational education practice.

A Basis for R.C.U. Evaluation

It is extremely difficult to move confidently toward a basis for evaluating any institutionalized structure engaging in educational research. Not enough is known about whether the conditions favorable to survival are also the conditions which maximize the educational significance of research output. The field of education includes the scattered wreckage of efforts to institutionalize a research and development function. Notable are the Bureaus of Educational Research which were common a few decades ago in many prestigious universities. Most have now ceased to exist, or they have assumed a changed focus and mission. The field of education still awaits a durable model of institutionalized research productivity capable of attacking a broad range of educational problems and capable of serving as prototypes with respect to structure and function.

With the foregoing observations regarded as caveats, an attempt will be made to provide a list of basis conditions which, if present, should strengthen the role and function of Research Coordination Units.

1. Research and development should be conceived as a single entity, rather than as separate or independent functions. Specifically, research should be development motivated and development should be research-guided.

The research-development-dissemination sequence can be described as a declining curve of risk. Research can include the risks of failure, but development and its disseminated output cannot tolerate such risks. A most important risk reducing exercise for Research Coordinating Units is to regard research and development as a unitary concept or as functions with reciprocal obligations and mutual responsibilities in the educational improvement process.

2. Research and development should be viewed as a system of intervention for the purpose of improving educational practice. It may occur at two levels. It may seek to create new principles, new processes or new theories, or it may occur to create new materials, new procedures, or new products. At either level, its ultimate goal is to improve educational practice. It may, however, have intermediate goals involving sub-systems (i.e., the state plan, the management information system or the inservice-training programs), but its ultimate goal in intervention for the purpose of improving educational practice.
3. In establishing the priorities for the work of an RCU, the focus should be along two lines. First, there should be a systematic assessment of the needs in the field of vocational and technical education, and an assessment of the degree to which these needs are being met by existing institutions and practices. Practices in the field are often legislated and established initially as administrative questions, while the important problems of practice await later attention. Some of the favorite research topics, i.e., student achievement, placement, student characteristics and guidance often reveal symptoms of restricted opportunity or other constraints within the system. Vocational education needs a systematically-operating early-warning system to articulate with the five-year extended state planning functions. The second line of focus should be toward school practice. In the long run, the contributions to the field made by Research Coordinating Units will be directly proportional to the reliance placed on them by those involved in school practice in local education agencies. With the need for local education agencies to

establish long-term plans to articulate with state vocational plans, it becomes even more important for RCU's, as a system, to intervene for the improvement of practice, and also to allow those in school practice to intervene in the establishment of RCU priorities. An adequate approach to this is not solely through advisory committees or through dissemination efforts; it should include efforts to actually involve those in school practice.

4. The personnel of an RCU is the unit's most valuable and most costly asset. In the past, much has been said about the value of interdisciplinary and multidisciplinary effort, but there is still little evidence to allow conclusions regarding the optimum ways to mobilize such effort. Recognizing that such effort may have value that is yet unrealized, RCU's should also seek the benefit of team operations which involve personnel from local education agencies. School personnel are also specialists whose experience illuminates ideas and processes. Moreover, the involvement of school personnel is essential in the partnership needed for pilot programs, demonstrations, field testing and the various activities necessary to conceive of R and D as a single entity. Too often school-based personnel are involved as a last minute approach to expediting a plan. A deliberate plan to involve inter-agency personnel, as well as inter-disciplinary personnel, would appear to repay study by Research Coordination Units.
5. The product or output of Research Coordination Units is its visible sign of progress. Their work has paralleled the work of other agencies involved in R&D. The product has been mainly in the form of a collection of short-term projects, the establishment of a reference library or collection, the preparation of research bibliographies and summaries, and the conducting of dissemination conferences or institutes.

Hopefully these efforts can continue and expand. If resources become increasingly scarce and if increasingly difficult choices must be made, then the following points should be considered in determining the value of RCU's to education:

- (a) Reduce the number of projects and include only those which show the greatest promise for impacting on school practice.
- (b) Focus on quality rather than on the number of individual items sent to the printer.

Summary

Throughout this presentation, certain principles have shown themselves repeatedly. Hopefully these can be considered as a basis for evaluation and may serve as a basis for sustaining and increasing the value of Research Coordination Units. In summary, these principles are as follows:

1. Objectives are of crucial importance to any R&D agency, but even more important is the question of how you get them. They must arise from the needs of the field, and they must be understood by those whose practice is required for implementation.
2. Research Coordination Units are mechanisms intended to intervene, and hopefully, improve the nature of educational practice. Their effectiveness is likely to be proportional to their willingness to allow school practitioners to intervene in the process of research and development.
3. Research Coordination Units should move in the direction of programmatic research activities, rather than episodic and unrelated short-term projects. At the same time, short-term projects should not be rejected if there is an urgent demand for them to facilitate development, or to contribute to long-term goals.

4. Coordination may be an unfortunate label for an R&D function.

Its only appropriate interpretation is as a process for integrating the functions of research, development and practice, and not as a responsibility for exercising an administrative influence over the agencies or individuals engaged in these activities.

5. Research Coordination Units must be regarded as one of a series of institutional experiments. They are still in a fragile stage of development, but they hold the promise and potential of becoming the vital, but missing link, in the improvement of educational practice. In fact, they may become the model for system-wide educational improvement within state jurisdictions. They are highly diverse in character, and their diversity is an important aspect of their great value to education. The more successful ones will have an instructive influence on those with less apparent success, but all will serve a mutually beneficial role to each other. In the long run this will be the most important evaluation process available.

EPDA: Its Purpose; Its Process; Its Needs

Paper presented by Charles H. Buzzell, Coordinator, National Leadership Training Institute, at the National Conference of Research Coordinating Unit Directors, Houston, Texas, April 8, 1970

EPDA: Its Purpose; Its Process; Its Needs

- I. This paper will discuss the Education Professions Development Act (EPDA) as it relates to Vocational Education (Part F). In this discussion an attempt will be made to 1) trace the temperament behind the major vocational education legislation in order to emphasize the reactionary posture of this recent act; 2) discuss the delivery system designed to implement EPDA; 3) outline the purpose of the LTI; and, 4) discuss some of the most critical needs which the director of a vocational education personnel development program has.

The direction of this discussion is intended to provide appropriate insights into the needs of vocational education personnel development in order to assist the RCU Director in designing supportive strategies.

EPDA: Its Purpose

- II. If one were to examine the major legislation which has affected vocational education in the United States, he would find that every significant Act could be thought of as reactionary legislation. All of the enabling legislation affecting our field, when examined in the context of its time, demonstrates how we as a nation tend to respond, after-the-fact to the needs of our people. We do not, in most cases, initiate legislation in response to anticipated needs. Once we do begin to develop legislation however, it tends to assume an anticipatory posture. EPDA is no exception. The Morrell Act (1862) for example, was the result of

a nation at war reacting to an unmet need for soldiers, farmers, and mechanics. The Smith-Hughes Act was passed into law on February 23, 1917 by a Congress which was to declare war within a few months. This Act was again, a reactionary piece of legislation resulting from an identified shortage of adequately trained manpower for the farm and industry. The post-war legislation of the mid 40's - George Barden Act, G. I. Bill, etc. - reflected the same reactionary quality of those laws which preceded them and those which were to follow.

The reaction of our nation to Sputniks as manifested in the enactment of the National Defense Education Act is still quite vivid in the minds of most educators. The recession of the late fifties can be seen as a major stimulus to the Manpower Development and Training Act of 1962 and the Vocational Education Act of 1963. In addition we can find the social pressures of the last five years reflected in the change in focus-from programs to people-mandated by the Vocational Education Amendments of 1968.

With this brief and possibly oversimplified review of some of the legislation which has had an affect upon Vocational Education we come to a discussion of the purpose of Part F of the Educations Professions Development Act.

Part F of this Act is found in two Congressional Acts. It is Part F of Title II of the Vocational Amendments of 1968 and Part F of the Education Professions Development Act. Although Part F originated within the Vocational Education Amendments of 1968,

(Title II), it amended the Education Professions Development Act of 1967 and is administered therein.

Part F of EPDA also reactionary legislation, born as a result of unmet needs, has as its major focus the improvement of the quality of teaching in Vocational Education. This improved teaching, it is felt, will come from a concerted effort aimed at improving the quality of the vocational education personnel who are responsible for this teaching. Stated another way, EPDA, Part F is designed to improve the quality of vocational education by improving the competencies of those responsible for it.

EPDA: Its Process

With its purpose identified - improving vocational education by improving vocational educators - the Act describes the process to be followed in meeting this objective.

Basically, the disbursement of federal funds will be achieved through the funding of special projects which are submitted under sections 552 and 553 of Part F. Taken together, these two sections are intended to finance programs which will create:

- 1) Section 552. Opportunities for experienced vocational educators to spend full-time in advanced study of vocational education for a period not to exceed three (3) years in length.

Section 553. (a) opportunities to up-date the occupational competencies of vocational education teachers through exchanges of personnel between vocational education programs and commercial, industrial, or other public or private employment related to the subject matter of vocational education.

(b) Opportunities for inservice teacher education and short-term institutes for vocational education personnel; and, (c) Opportunities for training and development experiences which are designed to familiarize vocational teachers with new curricular materials in vocational education.

Section 552, will be implemented through the granting of 160 leadership training awards. Those receiving these Leadership awards will pursue doctoral studies in the eleven institutions taking part in the program.

These institutions are:

University of California, Los Angeles
Colorado State University
University of Connecticut
University of Georgia
University of Illinois
University of Minnesota
University of North Carolina at Raleigh
Ohio State University
Oklahoma State University
Oregon State University
Rutgers University

Each participant chosen by the U. S. Commissioner of Education will be eligible to receive a stipend of \$3,500 per academic year, plus \$400 per dependent. If the doctoral program has a summer component, the participant may receive an additional \$700 plus \$100 per dependent.

Section 553:

The delivery system for implementing this section of the Act is built upon what has come to be known as a State Plan for Vocational Education Personnel Development. This State Plan concept requires

each state to assess its vocational education personnel needs; determine the effect of current efforts aimed at meeting these needs; and finally analyze the resulting difference, if any, between the identified needs and the results of the states efforts at meeting these needs. In the event a state finds through this assessment, that these are still unmet personnel needs, it can petition the Office of Education, Bureau of EPD for Federal Funds. The manner used for applying these Federal resources to the unmet personnel needs of the state is the project method. This method requires the state officer, responsible for vocational education, to submit a project proposal which demonstrates how the project intends to speak to the needs identified in the development of the State Plan. One of the principle concerns is that there be an assurance that Federal funds be used to supplement and not supplant state efforts.

The logic for designing such a delivery system is quite simple: Basically, the system provides for the efficient and systematic evaluation of the vocational education personnel needs of a state and attempts to insure that the efforts of the state will, in meeting these needs, be programmatic and not episodic.

In summary then, there are two methods under part F of the Education Professions Development Act for bringing Federal resources to bear on the national problem of developing qualified vocational education personnel. First, funds will be made available to selected Universities for training experienced vocational educators at the

advanced degree level. Second, funds will be made available to the States, via the project method, in order that they be able to supplement their efforts for meeting these vocational education personnel needs.

LEADERSHIP TRAINING INSTITUTE

In the early months of 1969, a project was funded by the Bureau of Education Personnel Development which provided for the establishment of the Leadership Training Institute in Vocational Education, (LTI). This project, one of eleven funded through the Bureau, is being administered within the New Jersey State Department of Education, Division of Vocational Education, under the directorship of Dr. Robert M. Worthington.

Since its inception, this LTI has directed its energies toward assisting the Bureau of Educational Personnel Development in carrying out its overall objective. Specifically, the direction adopted by the LTI for meeting its responsibilities has been to design and conduct regional leadership training institutes which would assist the various states in developing a comprehensive State Plan for vocational education personnel development.

To assist him in carrying out the objectives and responsibilities of this project, Dr. Worthington has had the advice and counsel of a national panel of consultants. These individuals, representing nearly every sector of society have given their time and talents in order that this project be successful.

VEPD: Its Needs

With the foregoing as background, this discussion will now focus upon the specific needs of a director of a state vocational education personnel development program and attempt to point up the areas where the RCU can provide invaluable aid.

In order to build a comprehensive and relevant vocational education personnel program in a state, it is absolutely necessary to know the numbers and kinds of vocational personnel which will be needed over time. This need assessment is anticipatory in the sense that the training which is designed to take place today is intended to provide personnel to fill positions which will be available at some future time. The needs then, which the person responsible for VEPD has in designing training programs, are manifold.

Future Job Needs:

First, the director of VEPD must be able to forecast the types of jobs which will be available at varying times in the future. He must not only be able to forecast the number of these jobs, he must also be able to determine the kinds of skills and knowledge which these jobs will require. To illustrate the importance of this need let us suppose that in a particular geographic region which we shall call Community A, the job opportunities for people trained as keypunch operators are rapidly declining as a result of the influx, in the area industries, of optical scanning equipment. When this change begins to take place, the classroom teacher

who has had the responsibility for training manpower for this aspect of data processing may react in one of two ways. First, he may ignore or be oblivious to the trends and continue to train for the industry in the conventional manner. However, he may be sagacious enough to anticipate this growth and forecast the revolution which would come to pass if a breakthrough in the technology were to take place which would bring down the cost of such equipment to a point where the worker could no longer compete.

If the vocational teacher reacts in the way first described, and there is no higher authority to provide direction and an opportunity for updating competencies, the vocational education process will have failed in its responsibility to provide relevant training. In the event, the teacher reacts as we would hope, he must be provided the means for updating his skills. It is to this end that the director of VEPD can bring to bear the resources at his command. In summary then, the first need of the director of VEPD is for comprehensive information on the changing job structure of his area as it relates to numbers of employees and types of competencies which will be required.

Manpower Available

A second need the director has, is for an accurate projection of the manpower which will be available to meet the anticipated demands identified above. Here again it is essential that the assessment include the types of skills and knowledge needed as well as the number of workers.

In making this assessment of the size and type of the labor pool which will be available, all sources must be considered. It is not sufficient to consider just vocational education graduates in computing this figure. Workers are provided from a number of other sources such as private training schools, migrants from other geographic areas as well as from other occupational classifications and workers trained "in house" by various industries.

People with Training Needs

A third need which must be spoken to if vocational education personnel are to meet their responsibilities is the need for identifying groups of people who need training.

It will not be of sufficient help to the director of VEPD to receive a count of these groups; he must know to mention just a few, the degree to which they are ready to receive specific vocational training; the kinds of work perception the individuals within these groups have; and, the types of training techniques and environments which would be most successful in bringing them to a level of job competency which would insure their employment. The answers to these types of questions and many others are absolutely essential if personnel are going to be trained and/or retrained to teach these groups.

A fourth need which directors of VEPD programs have is the need for assessing which type of training or retraining program has the greatest payoff for the resources invested. It is more effective for example, to send teachers to industry for updating or have

industry come into the schools? Are exchange programs with one year "turn around time" more effective than those which return personnel every six months? The point to be made here is, that we must know, in addition to the alternative types of training programs, the effectiveness we can anticipate from these alternatives.

In summary, this paper has attempted to show that:

1. The Education Professions Development Act, like nearly all legislation affecting vocational education was reactionary in nature. It was born as a result of unmet need and Part F clearly carries a mandate to the vocational education profession that these needs must no longer be allowed to go unmet.
2. The method decided upon in Washington for bringing the resources of the Federal Government to bear upon the personnel problems of vocational education in a state, has been such that it is essential for a state, requesting federal assistance, to develop a plan for vocational education personnel development which articulates its objectives with the overall State Plan for Vocational Education.
3. The needs of the director of a state VEPD program are manifold and the extent to which the state's Research Coordinating Unit can provide a supporting capability will have to be decided in light of existing resources, previous commitments, and the assignment of priorities.

The information needs of the VEPD director which were discussed may

be met in a variety of ways, some existing, some not. Briefly, these needs can be summarized as follows:

- A. The need for information on the job vacancies which will occur over time. This includes information on numbers of openings as well as information on the competencies which will be required by these jobs.
- B. The need to determine the numbers and competencies of workers available for jobs over time.
- C. The need to identify groups of people, and their relevant characteristics, who need job training.
- D. The need for information about the most appropriate types of vocational training methods.
- E. The need for assistance in identifying and applying cost-effectiveness measures to alternative vocational education personnel training programs.

In an expanding economy, there will always be jobs looking for people and people looking for jobs. One of the primary responsibilities of vocational education is to help train job seekers to fill "seeking jobs."

Methodology of Curriculum Development
TERC Electromechanical Project

A Research and Development Project

conducted by the
Technical Education Research Center
Cambridge, Massachusetts

and
Oklahoma State University
Stillwater, Oklahoma

Donald S. Phillips, Associate Project Director

The research reported herein was performed pursuant to a contract with the Office of Education, U. S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

Methodology of Curriculum Development
TERC Electromechanical Project

One of the most complex problems faced by the technical educators is the design of effective curricula. Many of the methods and techniques which have been successfully used in other educational areas are of little value in technical education. For example, attempts to develop curricula by assembling groups of conventional courses have generally been less than satisfactory. The rapid expansion in technology and the development of new technologies is increasing the complexity of this important educational function. The emergence of new technician occupations that cross established fields of specialization certainly adds new dimensions to the problems.

Educational planning for these occupations can be effective when the findings of well-designed research studies are used as the basis for planning. Research studies should develop new and more effective methods of occupational analysis and techniques for translating the results into new educational programs. To accomplish this requires a four step process: (1) occupational analysis; (2) program planning; (3) program development and testing; and (4) documentation and dissemination of results.

The Technical Education Research Center in Cambridge, Massachusetts, is currently engaged in research and development projects related to four emerging technologies: Bio-medical Equipment, Electromechanical, Nuclear Medicine, and Electro-Optical. The purpose of these projects

is to accelerate the development and implementation of training programs.

This discussion will deal only with the electromechanical project which is being conducted in cooperation with the Department of Technical Education at Oklahoma State University. Currently the project is in the development and testing phase.

A research project completed in 1967 by the Oklahoma State University (ERIC ED 012 372)¹ covered phases one and two of the process. Methodology and results of these efforts are summarized in Appendix A.

Occupational Analysis

From this work it was learned that the job requirements for electromechanical technicians are unique in many respects. This technology is not a hybrid combination of knowledge and skills achieved by grafting one field of specialization on another. Nor is it an admixture, produced by exposing students to a selection of discrete courses in electricity, electronics, and mechanics. It is, instead, an integrated whole -- a phenomenon in and of itself, and should be treated as such in an instructional program that is to be really effective.

To get some idea of what this means it may be helpful to use graphical techniques. If electronics technology and mechanical technology are considered to be represented by areas, they will overlap somewhat as shown in Figure 1. This region of overlap represents those applications which embody both electrical and mechanical principles.

¹Roney, Maurice W. Electromechanical Technology, A Field Study of Electromechanical Technician Occupations, Part I. A Post-High School Technical Curriculum, Part II.

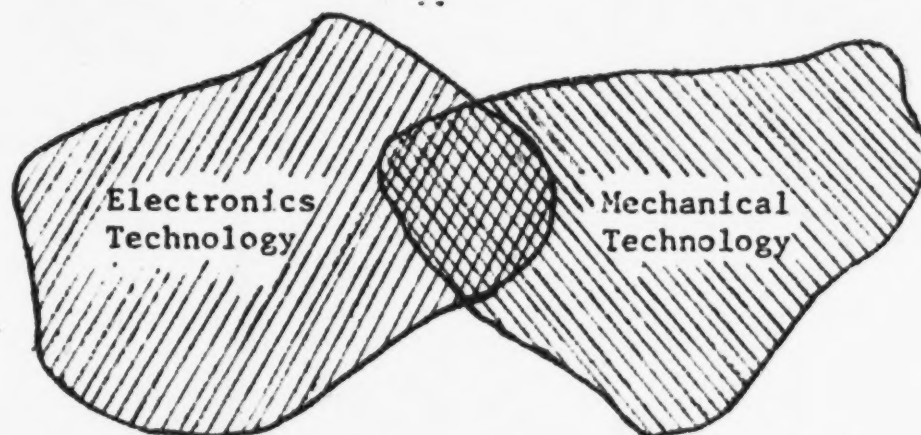


Fig. 1 Electronics and Mechanical Technology

Rotating electric machines and instrument movements are excellent examples of devices found in this region.

Electromechanical technology emphasizes these shared applications but is not limited to them. Indeed, EM technology includes not only the region of overlap between electronics and mechanical technology, but also a considerable portion of each and a substantial amount of material which is found in neither. Figure 2 shows this situation.

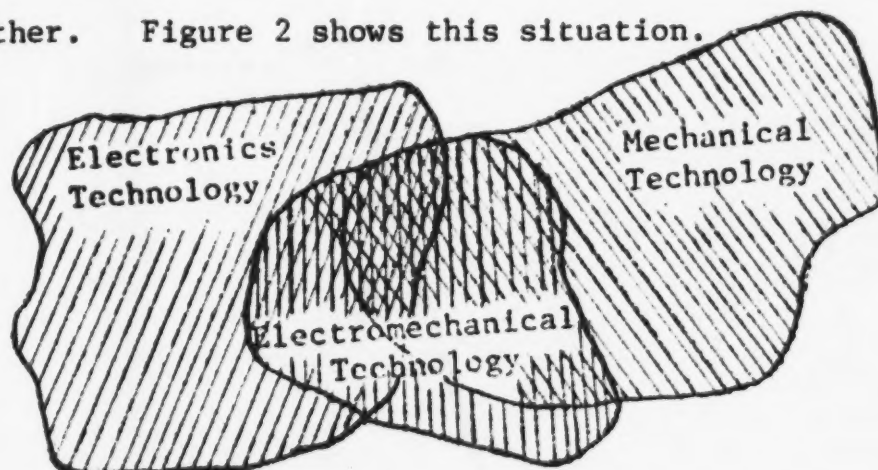


Fig. 2 The Scope of EM Technology

It is particularly important to notice that EM technology is more than just selected topics from electronics and mechanics. It includes topics such as optics and acoustics which are not usually found in either electronics or mechanical technology.

While electromechanical is an emerging technology, it should be pointed out that it is not entirely new. In fact, technicians have been employed in this field for several years. In the past these individuals have pri-

marily been trained in electronics and have relied on practical on-the-job experience and in-plant training programs in mechanics and other related fields to round out their ability. This system, while having some advantages, does suffer from several severe limitations. Among these limitations are:

1. The electronics training is frequently broader than necessary. It often includes topics such as electronic communications systems which are of relatively little value to the EM technician.
2. The on-the-job experience is frequently quite restricted in scope, making professional advancement slow and difficult.
3. Little or no emphasis is placed on the region of overlap between electronics and mechanics. These topics then become unnecessarily difficult to master.
4. Many individuals are unwilling or unable to participate in the training programs.
5. Because of the factors cited above, the time required to produce a fully qualified EM technician is prohibitively long. It typically extends to well over four years.

Until recently the demand for EM technicians was sufficiently small that while this process was not ideal, it was considered satisfactory. However, with the recent rapid growth of automated techniques, applications and systems, the traditional route outlined above is no longer adequate.

For purposes of comparison it is worth while to consider the pattern of education described above in slightly more detail. Figure 3 shows a schematic representation of the system. Particular notice should be taken of the fact that during the schooling period the specialty subject (electronics in this instance) is the central feature. All other related subjects flow

toward, and contribute to, the specialty subject.

This system has been very effective in dealing with single specialty subjects. With electromechanical technology, however, it tends to create substantially the same difficulties as outlined above and is, therefore, unsatisfactory.

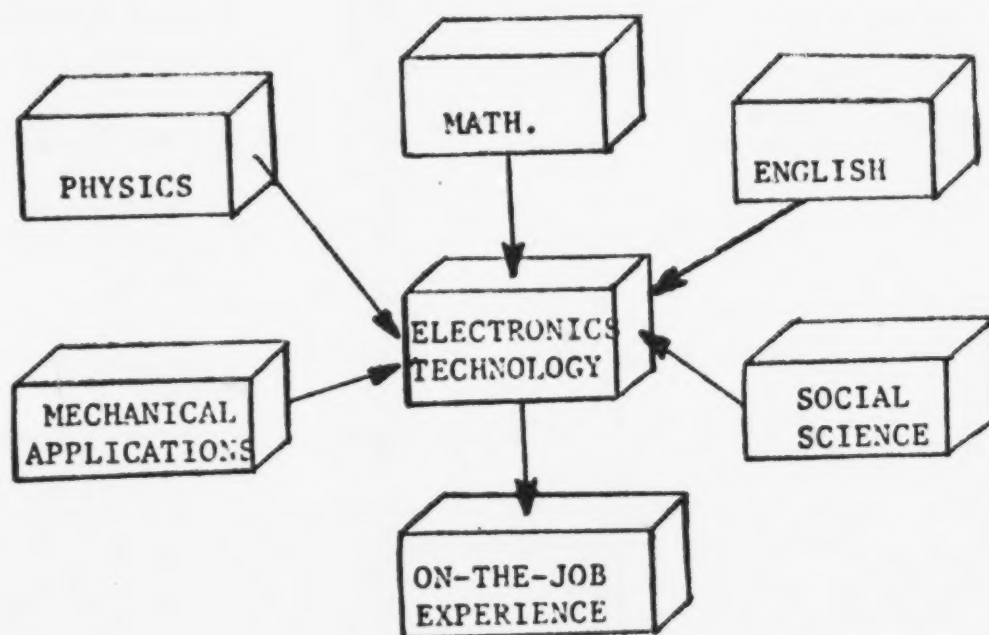


Fig. 3 The Traditional Route to Electromechanical Technology

The problem seems to grow out of the fact that in this technology it is the basic technical principles which must be developed rather than the technique and knowledge appropriate for a single specialty.

Program Planning.

This phase of the project incorporated the findings of the occupational analysis into a proposed curriculum plan. Development of the plan was accomplished by a group of experienced technical educators with the assistance of a national advisory committee of employers and technical school administrators. Guide lines used in developing the curriculum were as follows:

1. The training (of electromechanical technicians) should put emphasis on electrical and mechanical principles rather than on specific applications of these principles.
2. Communication skills are extremely important in the work of electromechanical technicians and should be given special attention in the training program.
3. A study of the interrelationship of electrical and mechanical elements of systems and devices should be central in the specialized technical courses of the instructional program. Whenever possible, electrical and mechanical principles should be studied together, and not as separate entities.
4. Principles of electrical and mechanical physics are basic tools in the work of electromechanical technicians and all technical instruction should develop analytical skills for which these tools are fundamental. In addition, there is an increasing need for the technicians to work with new applications of other physical sciences such as: optical equipment, thermal energy devices, hydraulic and pneumatic controls, and a wide variety of measuring instruments.

The proposed program plan called for a careful integration of mathematics, physics, and technical study in the first two terms. A great deal of experimentation to determine the most effective ways of obtaining this was recommended. One of the most significant elements of the plan related to the teaching of physics. Instead of using the traditional discrete units of mechanics, electricity, heat, sound, and light, the use of a system of unified concepts was recommended

Development and Testing

A project to develop and test the curriculum plan was begun in April 1968, under the provisions of a grant from the U. S. Office of Education. The project is directed by the Technical Education Research Center. Development and initial testing of curriculum materials is being carried out at Oklahoma State University. Further testing of the materials is being accomplished at the Milwaukee Technical Community College and the Texas State Technical State Institute.

The task of preparing an electromechanical technician in two years is quite formidable. The major objective of such a program is to produce graduates who understand and can apply technical principles from several areas. In addition, the graduate must have competencies in several technologies if he is to effectively communicate with specialists in those areas.

The curriculum plan developed during the program planning phase called for physics to hold a central position in the educational program. Technical concepts were to be introduced in the physics course and flow out to the technical specialty courses. Figure 4 shows how the system is structured. The curriculum outline based on this system is shown in Table 1.

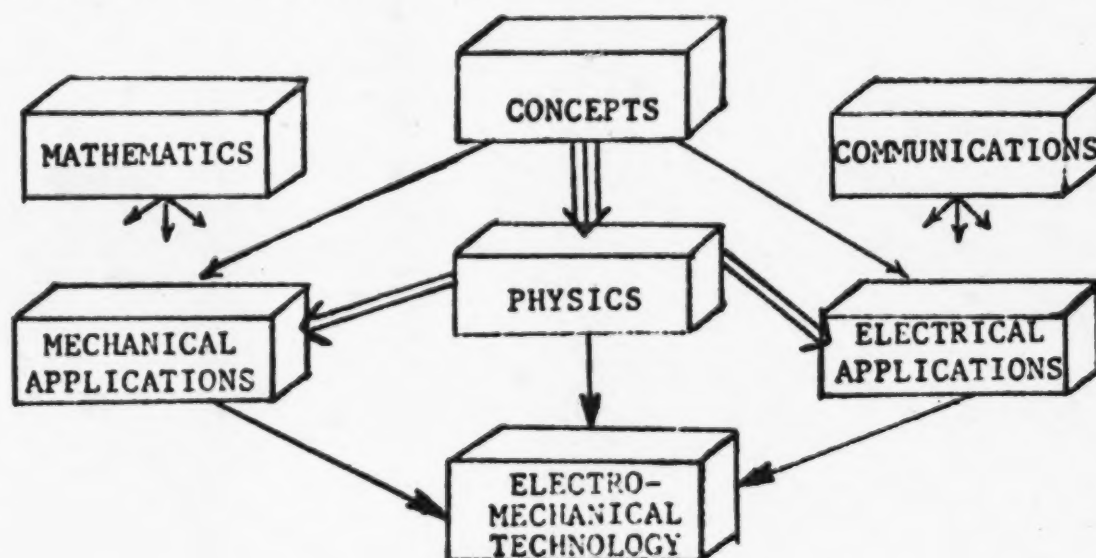


Fig. 4 Flow of Concepts in First Year Electromechanical Technology

TABLE 1

CURRICULUM FOR ELECTROMECHANICAL TECHNOLOGY

FIRST YEAR

<u>First Semester</u>		<u>T</u>	<u>L</u>	<u>C</u>
ELME 1103	Unified Physics Concepts	3	0	3
ELME 1104	Circuit Analysis	2	4	4
ELME 1114	Mechanics	2	4	4
ELME 1101	Technical Report Writing	1	0	1
ELME 1124	Physical Mathematics	3	2	4
ELME 1102	Electromechanical Devices	<u>1</u>	<u>3</u>	<u>2</u>
		12	13	18
<u>Second Semester</u>				
ELME 1202	Introductory Electromechanical Systems	1	3	2
ELME 1204	Mathematical Analysis	3	2	4
ELME 1203	Applied Physics Concepts	3	0	3
ELME 1214	Electronics	2	4	4
ELME 1224	Mechanical Analysis	<u>2</u>	<u>4</u>	<u>4</u>
		11	13	17

SECOND YEAR

<u>First Semester</u>				
ELME 2103	Social Science	3	0	3
ELME 2104	Electronic Logic Circuits	2	4	4
ELME 2113	Mechanics & Dynamics	2	2	3
ELME 2123	Control Devices	2	2	3
ELME 2114	Electromechanical Systems	<u>3</u>	<u>3</u>	<u>4</u>
		12	11	17
<u>Second Semester</u>				
ELME 2203	Social Science	3	0	3
ELME 2213	Communications Skills	3	0	3
ELME 2233	Electromechanical Design	1	6	3
ELME 2234	Automatic Control Systems	2	4	4
ELME 2224	Electronic Communications	<u>2</u>	<u>4</u>	<u>4</u>
		11	14	17

T = Theory - Hours per week

L = Laboratory - Hours per week

C = Credit - Hours per week

The aim of this system is to have the students study only one technical concept at a time. After the concept is introduced in the physics course, it is then studied in three technical courses where applications of the concept are shown.

The identification and selection of concepts to be used in developing the physics course was a major consideration. The concepts which were deemed appropriate to electromechanical technology are:

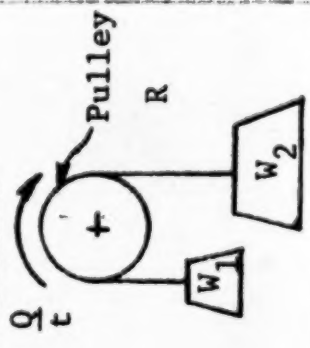
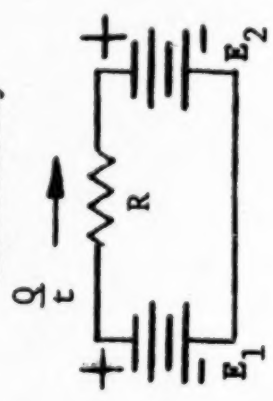
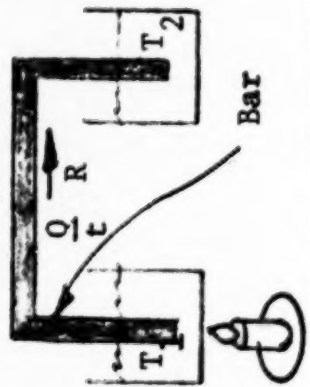
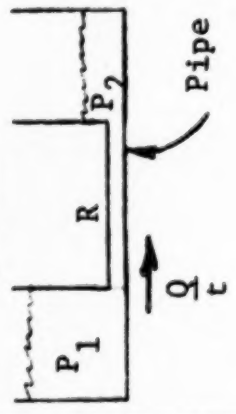
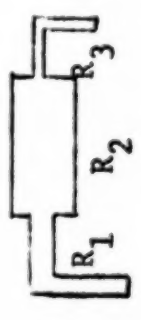
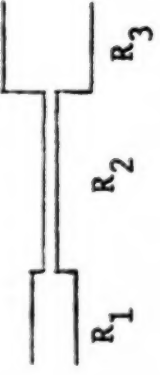
- | | |
|------------------------|----------------------------|
| 1. Differential Forces | 6. Impedances |
| 2. Flow Rates | 7. Resonance |
| 3. Real Opposition | 8. Waves and Fields |
| 4. Energy Storage | 9. Amplification |
| 5. Time Constants | 10. Feedback and Stability |

In electromechanical technology these concepts are applied in several areas such as:

- | | |
|-------------------|-------------------|
| 1. Electricity | 8. Acoustics |
| 2. Mechanics | 9. Mechanisms |
| 3. Hydraulics | 10. Vacuum |
| 4. Optics | 11. Metrology |
| 5. Thermodynamics | 12. Refrigeration |
| 6. Electronics | 13. Materials |
| 7. Pneumatics | 14. Magnetism |

It should be pointed out that while these application areas are appropriate to electromechanical technology, more emphasis is given to some topics than is given to others. An example of how four concepts can be applied in mechanics, electricity, thermodynamics, and hydraulics is shown in Table 2.

TABLE 2 APPLICATIONS OF UNIFIED CONCEPTS

Mechanics	Electricity	Thermodynamics	Hydraulics
 $\frac{Q}{t}$ Pulley R W_1 W_2	 $\frac{Q}{t}$ R E_1 E_2	 $\frac{Q}{t}$ R T_1 T_2 Bar	 P_1 R P_2 $\frac{Q}{t}$ Pipe
$\Delta F = W_1 - W_2$ Pounds	$\Delta E = E_1 - E_2$ Volts	$\Delta T = T_1 - T_2$ Degrees	$\Delta P = P_1 - P_2$ Lb/in ²
$Q = \text{Feet}$ $T = \text{Seconds}$ $Q/t = \text{Feet per sec}$ Velocity	$Q = \text{Coulombs}$ $T = \text{Seconds}$ $Q/t = \text{Coulombs/sec}$ Current	$Q = \text{BTU's}$ $T = \text{Min}$ $Q/t = \text{BTU}$ Flow	$Q = \text{Gal.}$ $T = \text{Min}$ $Q/t = \text{Gal/min.}$
$R = \frac{\Delta F}{Q/t}$ Friction	$R = \frac{\Delta E}{Q/t}$ Resistance	$R = \frac{\Delta T}{Q/t}$ Resistance	$R = \frac{\Delta P}{Q/t}$ Resistance
 R_1 R_2 R_3 $R_T = R_1 + R_2 + R_3$	 R_1 R_2 R_3 $R_T = R_1 + R_2 + R_3$	 R_1 R_2 R_3 $R_T = R_1 + R_2 + R_3$	 R_1 R_2 R_3 $R_T = R_1 + R_2 + R_3$

In developing the specialty courses three basic guidelines were used. These were:

1. The course should show applications of the Unified Concepts.
2. The course should use the vocabulary and techniques appropriated to the technology.
3. The course should have unity and continuity in and of itself.

To accomplish these objectives it was necessary to write new instructional materials for each course. At this time approximately seventy-five percent of the instructional materials for the first year program have been prepared and are being tested.

The materials developed to date have been in the form of laboratory texts, which includes a discussion of technical principles, an experimental procedure, data tables, analysis guides, and homework problems. Laboratories are considered to be an essential part of the instructional program. Costs, therefore, become a major consideration. In an attempt to keep costs to a minimum and provide flexibility, standard hardware items were used whenever possible. As an aid for evaluating the hardware costs, equipment utilization charts were prepared for each laboratory text. An example of this is shown in Appendix B.

Figure 4 shows mathematics as a service course to the physics and specialty courses. As such, it is not a great deal different from other technical mathematics courses. The main concern in developing this course is to coordinate with the other courses.

The communications course is also a service course. During the first semester the students are given one clock hour of formal communications instruction each week. In addition, writing technical reports is an

integral part of the student's educational experience in the technical courses. This system has proved to be quite effective with two groups of EM students to date.

The unified concepts system of teaching electromechanical technology has several advantages. Some of these are:

1. Equal emphasis is placed on electrical and mechanical applications.
2. Areas of overlap may be easily identified and appropriately exploited.
3. Important topics outside both electronics and mechanics may be identified and dealt with in the physics and electromechanical courses.
4. The time required for training can be held to two academic years.
5. Broad concept base allows subsequent continuation of education.

Another important advantage of this system is that students who have not made a firm occupational choice are given an opportunity to study several different technologies. At the end of one semester or one year students may transfer to other related technical programs with less loss of credit than if they had been enrolled in a single specialty technology.

As can be seen from this discussion, the success of this program is greatly dependent upon teacher cooperation and coordination. Without this the program will be less than satisfactory. With this, however, the educational gains can be quite exciting. Some teachers who have participated in this program are convinced that their students have learned more about their specialty in this program than they would have in a single specialty program. The reason for this is that the student learns technical concepts, techniques, and procedures in each of his courses which are useful in the other courses.

During the past year fourteen individuals have been enrolled in a Master of Science Degree program preparing to assume leadership roles in establishing EM technology programs. These students, studying under the provisions of an EPDA grant, have worked very closely with the developmental program to learn first hand some of the many problems associated with developing a new educational program.

Dissemination

Regardless of how effective the work to date has been, the program cannot have an impact unless the dissemination function is effective. Although the development and testing is still under way, the dissemination function has begun in a limited way. Several teachers and administrators have visited the campus to examine the program in detail. A number of institutions are planning to implement an EM program based on the unified concepts system this fall. Two new institutions are planning to use the first year of the EM program as the first year of several related technologies.

It is hoped that during the next year the results of this program can be disseminated to a much wider audience. It is also hoped that the instructional materials developed under this project will be published by a commercial publisher. It seems that this would be the most effective method of making the materials available to a large number of schools.

APPENDIX A

EDUCATIONAL PLANNING FOR AN EMERGING OCCUPATION

A Summary Report of a Research Project in Electromechanical Technology

Educational planning for emerging occupational fields can be especially effective when the findings of well-planned research studies are used to modify, extend, or reorient existing educational services. Research in occupational education should uncover new and more effective techniques of occupational analysis and translate the findings of this analysis into new educational programs. This is a four-step process: (1) occupational analysis; (2) program planning; (3) program development and testing; and (4) documentation and dissemination of the results.

A research project recently completed by the Oklahoma State University (Contract No. OE-6-85-057) covered phase one and two of this process. The occupational field under study was the emerging field of electromechanical technology. Phase one of the project was a field study of the electro-mechanical technician occupation with a concentration on the unique educational requirements of the occupations. Phase two was the design of an educational program to provide these unique requirements.

The field study of occupational needs was conducted in two parts. The first part consisted of an in-plant study of the electro-mechanical technician occupations to determine what skills and knowledge combinations are required and whether or not existing educational services are providing these requirements. Depth interviews were held with administrative and supervisory personnel in 26 selected industrial organizations. These organizations ranged in size from 50 employees to more than 35,000 and were geographically distributed from

New England to California. The field interviews identified an immediate and urgent need for individuals with a background of education and training significantly different from that obtained in existing technical education programs. Details of this need and the specific occupational requirements may be found in Part One of the project report.

The second part of the field study obtained a measure of the quantitative need for technicians with electromechanical training. A mailed survey was used to obtain information from 93 organizations employing technicians who work with both electrical and mechanical devices and systems. These 93 organizations expect to employ 20,329 additional electro-mechanical technicians by 1970 - a total 25% greater than their combined need for electronic technicians and mechanical technicians. A summary of the returns from this survey as shown in Table I.

A Panel of Consultants with national representation provided advisory services and assisted in planning and conducting the field study. These consultants were selected to represent several kinds of industrial activities such as manufacturing, research, distribution, and service. The organizations selected included: the computer industry, electronics companies, government agencies, instrument makers, technical schools, and technical publishers. The panel played a vital role in the development and conduct of the study. In fact, the success of the study, as measured by the consistency and validity of the findings, was due primarily to the leadership and specific contributions of the Panel members.

During the course of the field interviews the research consultant probed for information and attitudes regarding the skill and knowledge required in industrial occupations of the type under consideration. An interview schedule was used but no attempt was made to obtain a set of

TABLE I
EMPLOYMENT AND PROJECTED NEEDS FOR
TECHNICIANS IN 93 INDUSTRIAL ORGANIZATIONS

Organizations by Principal Product or Activity	Number of Responses	No. of Technicians* with Specialized Training			Projected Needs for Technicians (New Hires)								
		Total	Electrical	Mechanical	Other	1967	1970	1967	1970	Electronics	Mechanical	Electro-mech.	1967
Manufacturing	60	34,303	30,351	2,552	1,400	2,944	10,301	840	2,530	4,666	18,478		
Research & Devel	14	973	405	280	288	87	131	64	113	77	177		
Design	3	111	76	33	2	4	4	5	5	13	19		
Calibration & Test	12	1,501	1,176	214	111	62	102	26	56	1,060	1,652		
Other	4	81	15	41	25	1	3	7	15	4	3		
Total	93	36,969	32,023	3,120	1,826	3,098	10,541	942	2,719	5,820	20,329		

*Includes only those who work with both Electrical (Electronic) and Mechanical Devices and/or Systems

answers to a rigidly structured information form. Rather it was thought more important, at this stage, to rely on the researcher's background experience in curriculum planning and technical teaching to interpret and record responses as objectively as possible. The principal advantage of this procedure appeared to be in establishing rapport with the industrial representatives involved. Also it conserved valuable time, an important consideration when busy administrative personnel were contributing to the study.

The second stage of the research project (program planning) incorporated the findings of the field study in a proposed curriculum plan. An outline of the curriculum is shown in Table II. Details of the program, including suggestions for staff and facilities, are included in Part Two of the project report. This curriculum plan differs significantly from any known technical education program and incorporates a number of ideas which resulted directly from the suggestions made by employers during the interview phase of the field study.

The need for equal attention to mechanical and electrical principles throughout the training program was underscored by employers. The systems and devices with which these technicians work are often extremely complex electrical-electronic-mechanical combinations. Employers emphasized the need for technicians with sufficient knowledge of electrical and mechanical principles to make judgments where both are involved. It was pointed out that individuals trained as specialists in either of these two fields tend to avoid decision-making responsibilities where the two elements are interdependent. In extreme cases, electronics specialists literally refuse to become involved in decision-making where mechanical problems appear. Mechanical

Table II

(R. 9-66)

ELECTRO-MECHANICAL TECHNOLOGY CURRICULUM

	ELECTRO-MECHANICAL COURSES*				PHYSICS COURSES				ELECTRICAL-ELECTRONIC COURSES				MECHANICAL COURSES				MATH & GENERAL EDUCATION COURSES			
	CLASS 1	LAB 3	CR. 2		CLASS 3	LAB 2	CR. 4		CLASS 3	LAB 4	CR. 4		CLASS 1	LAB 3	CR. 2		CLASS 5	CR. 5	CLASS 1	CR. 1
1st	MECHANICAL COMPONENTS AND INTRODUCTION TO ELECTRO-MECHANICAL SYSTEMS				TIME AND SPACE UNITS BASIC ENERGY SYSTEMS MECHANICS (STATICS, DYNAMICS) MECHANICAL MEASUREMENTS -- TEMPERATURE, PRESSURE				ATOMIC AND MOLECULAR STRUCTURE (CONDUCTORS, SEMI-CONDUCTORS) BASIC ELECTRICAL UNITS D.C. CIRCUITS A.C. CIRCUITS				USE OF HAND TOOLS FITS AND FINISHES THREADS AND FASTENERS MACHINES AND MACHINE PROCESSES				REVIEW OF INTER-MEDIATE ALGEBRA TRIGONOMETRY ADVANCED ALGEBRA			
2nd	HIGH ENERGY LIGHT SYSTEMS HYDRAULIC AND PNEUMATIC DEVICES HIGH VACUUM EQUIPMENT				SOLID STATE PHYSICS PRINCIPLES OF HEAT AND HEAT TRANSFER LIGHT AND OPTICS FLUID MECHANICS				A.C. CIRCUITS (CONTINUED) VACUUM TUBES SEMI-CONDUCTORS AND CIRCUITS POWER SUPPLIES AMPLIFIERS				MATERIALS TESTING ENGINEERING MATERIALS - METALS, TIMBER, PLASTICS SIMPLE STRUCTURES HEAT TREATMENT COMPOSITE MATERIALS				APPLICATIONS OF ANALYTIC GEOMETRY AND CALCULUS			
3rd	SYNCHROS, RESOLVERS SERVO-MOTORS AND GENERATORS CHOPPERS, TACHOMETERS SERVO AMPLIFIERS HYDRAULIC SERVOS DIGITAL-ANALOG CONVERTERS TELEMETERING DEVICES RECORDERS, PLOTTERS				ELECTRICAL MOTORS AND GENERATORS SPEED CONTROL TRANSMISSIONS CLUTCHES SERVO MECHANISMS INTRODUCTION TO CLOSED LOOP SYSTEMS				LOGIC CIRCUITS LOGIC SYSTEMS SYSTEMS ANALYSIS TIMING AND WAVE SHAPING CIRCUITS MEASURING INSTRUMENTS ELECTRICAL TRANSDUCERS				GEARS AND GEAR TRAINS PLANE MOTION DIFFERENTIAL MOTION MECHANICAL INTEGRATION AND TORQUE AMPLIFICATION AND FORCE AMPLIFIERS CLUTCHES AND COUPLINGS BEARINGS LUBRICATION				NUMBER SYSTEMS LOGIC SYSTEMS BOOLEAN ALGEBRA			
4th	ELECTRO-MECHANICAL SYSTEMS DESIGN PRINTERS DIGITAL READOUT MISSILE CONTROL ELEVATOR CONTROL TAPE TRANSPORTS TELETYPEWRITERS DATA STORAGE & RETRIEVAL				ELECTRICAL, MECHANICAL, HYDRAULIC PROCESS CONTROLLER VARIABLE POWER DEVICES COMPUTERS CLOSED LOOP SYSTEMS				DESIGN PROBLEM PROBLEM ANALYSIS DATA COLLECTION TECHNIQUES DATA EVALUATION TECHNIQUES PROBLEM DEFINITION PROBLEM SOLUTION(S) SOLUTION EVALUATION SOLUTION IMPLEMENTATION VERIFICATION								ECONOMICS			

* THE DEVICES AND SYSTEMS TO BE USED WILL BE SELECTED INDUSTRIAL APPLICATIONS.
THE ITEMS SHOWN ARE TYPICAL.

ADMISSION REQUIREMENTS:
HIGH SCHOOL ALGEBRA, TRIGONOMETRY, AND MECHANICAL DRAWING.

A PRE-TECHNOLOGY TERM WILL BE NECESSARY FOR STUDENTS NOT MEETING THESE REQUIREMENTS.

specialists are similarly reluctant to work with systems and devices that include electronic elements. Throughout the field study employers emphasized the critical need for persons who feel equally at home in each of these elements.

Equal, if not more, importance was attached to the electromechanical technician's responsibility for the communication of facts and ideas. It was apparent from the discussions with employers that the dual-technology functions of a technician working this capacity include a significant responsibility for interpreting technical information - as input for his own needs and as output for others. Here again, the unique nature of the communication skills needed in this occupation must be given consideration in the design of the curriculum. The need appears to be not so much for grammatical expertise as for technical accuracy. Obviously one without the other would be insufficient; both are required and both must be provided in the educational program.

The procedure followed in developing the electromechanical technology curriculum plan was to apply known principles of technical curriculum design to the findings of an occupational study. The study revealed a need for technical personnel with new combinations of skills and knowledge. The resulting curriculum plan consists of new combinations of course work and calls for facilities and instructional procedures that differ in many respects from those in single-technology instruction programs. The plan will, of necessity, require further development, modification, and evaluation in an actual teaching-learning situation.

An important part of the curriculum development process was the correlation of occupational analysis with instructional program planning throughout the project. This correlation was incorporated at several

points in the project. The first point at which this occurred was a briefing session for the Panel of Consultants on the general form of technology curriculums. This step is extremely important. Industrial personnel are generally unfamiliar with the procedures and processes of specialized occupational education programs. There are many kinds and levels of occupational education. Unless advisory groups of this nature understand the limitations of two-year programs they may not be realistic in making an identification of the occupations to be studied. Before any attempt is made to study occupational needs, it is the responsibility of the technical education specialist to delimit the proposed educational program. Failure to do this may result in much time being wasted by studying occupations for which the two-year technical program is not required. It is well to remember, also, that industrial job classifications and educational terminology are not yet sufficiently precise to provide the degree of reliability needed in educational planning.

Much additional developmental work will be required to make the proposed program a reality. In its present form it represents the best judgment of experienced technical education curriculum specialists as to the content, organization, and level of instruction required to prepare individuals for the electro-mechanical technician occupations. Much of the proposed program is new. Existing courses in electrical, electronic, and mechanical disciplines cannot be used without reorganization and a general reorientation to the program objectives. The third and fourth steps of the research process - development and testing, and documentation and dissemination of the results, remain to be accomplished.

APPENDIX B

UTILIZATION OF ELECTRONICS LAB MATERIALS

[illegible]

ITEM	REMARKS	QTY	TYPICAL MODEL	COST/EA	TOTAL
DC Power Supply*	0-30V 1/2 a	2	Elco 1020W	35.00	70.00
Variac*	0-130V 2 a	1	Superior 10B	10.00	10.00
Audio Generator*	0-30V 600Ω	1	H.P. 200 C	250.00	250.00
Oscilloscope*	Calibrated V Input	1	RCA WO 33A	140.00	140.00
VTVM*	11 meg DC Input	1	RCA WV 77E	55.00	55.00
VOM*	DC ma ranges to 1/2 a	1	Simpson 260-5	60.00	60.00
1 mfd Capacitor*	600 VDC oil filled	2	Aerovox CP 91	3.00	6.00
10 mfd Capacitor*	600 VDC oil filled	2	Aerovox CP 70	13.00	26.00
1:1 Transformer*	1/4 DVA 117 VAC	1	Freed IT-5	27.00	27.00
Resistance Sub Box	15Ω - 10 meg. 1w	2	Heath IN-37	7.00	14.00
Capacitor Sub Box	100 pf - 0.22 mfd	1	Heath IN-47	7.00	7.00
DC Power Supply	0-400V, fill & bias	1	Heath 1PW-27	120.00	120.00
4Ω Resistor	5W 5%	1	IRC 1A	.50	.50
10Ω Resistor	5W 5%	1	IRC 1A	.50	.50
15Ω Resistor	5W 5%	1	IRC 1A	.50	.50
100Ω Resistor	1/2W 5%	1	IRC RC-20	.25	.25
150Ω Resistor	1/2W 5%	1	IRC RC-20	.25	.25
220Ω Resistor	2W 5%	2	IRC RC-42	.50	1.00
470Ω Resistor	1/2W 5%	1	IRC RC-20	.25	.25
560Ω Resistor	1/2W 5%	2	IRC RC-20	.25	.50
1K Resistor	2W 5%	2	IRC RC-42	.50	1.00
1.8K Resistor	1/2W 5%	1	IRC RC-20	.25	.25
2.2K Resistor	1/2W 5%	2	IRC RC-20	.25	.50
3.3K Resistor	1/2W 5%	1	IRC RC-20	.25	.25
4.7K Resistor	1/2W 5%	2	IRC RC-20	.25	.50
6.2K Resistor	1/2W 5%	1	IRC RC-20	.25	.25
6.8K Resistor	1/2W 5%	2	IRC RC-20	.25	.50
8.2K Resistor	1/2W 5%	1	IRC RC-20	.25	.25
10K Resistor	5W 5%	2	IRC 1A	.50	1.00
15K Resistor	5W 5%	1	IRC 1A	.50	.50
18K Resistor	5W 5%	1	IRC 1A	.50	.50
33K Resistor	1/2W 5%	1	IRC RC-20	.25	.25
47K Resistor	1/2W 5%	1	IRC RC-20	.25	.25
68K Resistor	1/2W 5%	1	IRC RC-20	.25	.25
100K Resistor	1/2W 5%	1	IRC RC-20	.25	.25
330K Resistor	1/2W 5%	1	IRC RC-20	.25	.25
1 meg Resistor	1/2W 5%	1	IRC RC-20	.25	.25
Diode	Silicon Type IN270	4	Ohmite RC-20	.30	1.20
Diode	Zener Type IN2982B	1	Mallory	2.50	2.50
Transistor	NPN Type 2N1304	2	RCA	.60	1.20
Transistor	PNP Type 2N1305	1	RCA	.60	.60
Transistor	PNP Type GE 3	2	GE	4.00	8.00
Transistor	FET Type 40468	1	RCA	2.00	2.00
IC Oper Amp	SN 724L or Equiv.	1	TI	9.00	9.00
Tube	Triode/Pentode 6AU8	1	RCA	4.40	4.40
Tube	Dual Diode 6AX5	1	RCA	3.25	3.25
0.05 mfd Capacitor	600W VDC	1	Aerovox VI46XR	.50	.50
0.10 mfd Capacitor	600W VDC	3	Aerovox VI46XR	.50	1.50
0.20 mfd Capacitor	600W VDC	1	Aerovox VI46XR	.50	.50
10 mfd Capacitor	50 VDC	4	Aerovox VI46XR	1.00	4.00
100 mfd Capacitor	50W VDC	2	Aerovox VI46XR	1.50	3.00
Transformer	Transistor Driver	1	Knight 6-T-54 HF	3.00	3.00
Transformer	Transistor Output	1	Knight 6-T-52 VF	5.00	5.00
Breadboard	3" x 5"	2	Vector 837	2.25	4.50
Socket	Transistor	2	Vector 570B	1.20	2.40
Tube Sockets	Octal & Noval	1ea	Vector 567-1C, 568-1C	1.65	3.30
Socket	1C T05	1	Cinch Jones 10-ICS	.75	.75
Soldering Iron	35W	1	American Beauty 3110	4.50	4.50

*Items used in previous electricity course.

**THE RESEARCH IMPLICATIONS OF VOCATIONAL EDUCATION
FOR THE HANDICAPPED**

By

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**Speech delivered on April 8, 1970 at the
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Rice Hotel
Houston, Texas**

THE RESEARCH IMPLICATIONS OF VOCATIONAL EDUCATION
FOR THE HANDICAPPED

WHO ARE THE HANDICAPPED?

There are several ways to look at the subject under consideration. Technically, a handicap is a loss of function, not always disabling, that results from a chronic physical or mental condition. The chronic condition may be a long-lasting disease or a physical impairment. The definition contained in the 1968 Amendments to the Vocational Act makes it clear that both physical and mental handicaps are included.

While it is true that not all chronic conditions cause handicaps and not all handicaps result in disabilities, the immensity of the problem is still staggering. For example, in 1966, there were almost 94 million persons in the United States with chronic conditions, and more than 21 million were limited in activity in some way. Presently, we are increasing permanent impairments at the rate of more than 80,000 annually.

Many of the handicapped can be rehabilitated through special treatment, retrained, and returned to gainful employment. The Vocational Rehabilitation Administration of the United States has been doing this for many years. For example, the caseload has run from 121,000 in 1946 to 164,000 in 1955 to 480,000 in 1966. At the same time, 36,000 were rehabilitated in 1946, 58,000 in 1955, and 154,000 in 1966, with more than 100,000 going into jobs. Further, it is estimated that a minimum of 3.7 million persons currently not in the labor force due to handicaps could be brought to employability with appropriate assistance. Certainly, vocational education can become a major link in this employability chain when the 1968 amendments require that not less than 10 percent of the states' funds be spent for:

Vocational education for handicapped persons who, because of their handicapped condition cannot succeed in the regular vocational education program without special educational assistance, or who require a modified vocational educational program.

In addition to physical impairment, there is mental impairment. Often, it is mistakenly believed that training and rehabilitation of the mentally impaired are more difficult and virtually impossible. While it is true that the number of persons in mental institutions is now over 200,000, and rehabilitation may be impossible for some, mental impairment runs from psychosis to behavioral disorders to mental retardation. All these are included in the case load of the Vocational Rehabilitation Administration, and, in 1966, only orthopedic deformities had a higher percentage of rehabilitations than did psychosis and mental retardation. Before proceeding further with mental impairments, however, it is well to keep in mind that the 1963 Act, as well as the 1968 amendments, included:

. . . vocational education for persons who have academic, socioeconomic, or other handicaps that prevent them from succeeding in the regular vocational education program.

Thus, while it may be technically possible to separate mental handicaps from academic ones, etc., the practical line between them is often thin, or non-existent, and the root cause of both is often the same. Fortunately, the new dimension added in the 1968 amendments makes it unnecessary to ascertain thin lines of difference, for service to all is included. It should be worth a moment of our time, however, to review the evolution of change in our industrial society which has necessitated the adding of the new dimension of mental deficiency.

WHY THE CONCERN FOR THE HANDICAPPED?

In brief, during the past fifteen or so years, we have moved to the latest stage of technology known as automation where machines run machines. While this is vital to economic growth and has contributed greatly to affluence, it also has contributed to a problem faced by vocational educators. For example, we have moved from a labor force which was largely blue collar as late as 1950 to one which is white collar, service oriented today. Each year we are able to turn out the same amount of goods and services as the previous year, but with 2 to 3 million fewer workers, and most of the disappearing jobs are unskilled and semi-skilled. Thus, a great deal of pressure is put on training of a vocational-technical nature. This problem is complicated by the data, well known to you, which shows that, for every 10 pupils in the fifth grade in 1959-60, only 8.5 entered the eleventh grade in 1965-1966, and 7.2 graduated from high school in 1967. Of those graduating from high school in 1967, 1.2 entered occupations in which they received some vocationally oriented education courses. Two of them started work without any occupational preparation. Four entered college in 1967, but not more than two are likely to graduate in 1971. Although there are many variables which enter into projecting the data, such as the possible need to have a larger percentage graduate from both college and high school, it is clear that far more than 1.2 out of 10 need some vocationally-technically oriented education. Yet, as late as 1967, 59 percent of the high school students in the South attended schools where no courses of this nature existed.

All this is happening at a time when youth and female adults are pouring into the labor force in record numbers. Thus, for the past decade, the unemployment rate for teenagers has been running at least three times the national average, and as late as last year, was almost six times the rate for those over 20. Turning to the picture for Blacks, the past history of discrimination and educational inequality has resulted in

the black work force's having an unemployment rate two to two and one-half times that of the white. Further, only 58 percent of black children are completing the eighth grade, as against 73 percent of their white classmates, and about 40 percent of black teenagers finish high school compared with 62 percent of whites. Thus, while unemployment for white teenagers is still about three times the national average, it is more than six times for the black teenager. The story for the Mexican-American is almost as bad as for the Black, and, for the Indian, it is even worse.

The last portion of our evolution of change relates to the vast migration from the rural area, especially the farm, to the cities. While much of this out-migration is composed of whites, a majority of it is Blacks from the South. Thus, while 43 percent of the Blacks lived in central cities in 1940, it was 56 percent by 1966. As the Blacks move in, the whites move to the suburbs, so that today 25 percent of the population of our central cities of one million or more is Negro, and fewer Negroes, proportionately, live in suburbs today than did in 1950.

Given the problems listed above, it is not surprising that we discovered poverty in America in the early 1960's and that the cores of our central cities were becoming ethnic ghettos. While the percentage in poverty has dropped considerably below the 20 percent of the early 1960's, it is still far too high and the percentage of non-whites of the total number in poverty is increasing. While we do not have the kind of data which are available for the nonwhite, the studies we do have indicate that Mexican-Americans, often due to the language problem, have an education handicap of from 4 to 7 years vis-a-vis the rest of the population. For example, one tract in Houston was found to have a 5.4 educational level. Thus, high unemployment, low-paying jobs, poverty and crowded slums are known to this group too. For the Indian, the situation is even worse with an average education of about 5 years, unemployment often ranging from 40 to 75 percent, an average income of less than \$30 a week, and

90 percent living in tin-roofed shacks, leaky huts, brush shelters, etc. Thus, poverty is a way of life. Add to this the areas from whence came the urban migrants, and you have deteriorating areas with little opportunity for growth, high unemployment, low pay and 14 million rural persons reported to be in poverty by the President's National Advisory Commission on Rural Poverty.

The sum of the poverty story, then, is largely the sum of the academic and socio-economic handicapped the Vocational Education Act talks about, for three-fourths of the nation's mentally retarded are in the isolated and impoverished urban and rural slums. A child from a low income family is fifteen times as likely to be retarded as is a child from a higher income family. They often arrive at school age with neither the experience nor the skills necessary for systematic learning, and a large number of them continue to drop further behind each year. Thus, public school students in the low income areas of inner cities are from six months to three years behind the national norm of achievement for their ages and grades.

It would appear, then, that the conditions of poverty, whether related to a Black in an urban ghetto, a white in Appalachia, a Mexican-American in the fields, or an Indian on the reservation, contribute to and nurture mental retardation, including broadly-defined mental disabilities. It may be noteworthy to point out that it is probably in these same physical locations that the greatest paucity of vocational education exists. What, then, is the challenge of the new vocational services contemplated by the 1963 and the 1968 Acts for the physically, mentally, academically, and socioeconomically handicapped, and most especially, what are the implications for research?

VOCATIONAL EDUCATION'S OBLIGATION TO THE HANDICAPPED

First, let us look at the challenge of providing vocational services to the new groups. The nature of vocational education remained basically unchanged from 1917 to 1963. This was due partly to the assumption that the Vocational Rehabilitation Administration was responsible for the handicapped and the fact that the federal government, generally, did not recognize the need to relate to the academic and socioeconomic handicapped until MDTA in 1962. In this 1962 environment, a report of the Panel of Consultants to Vocational Education stated that vocational education was insensitive to changes in the labor market and to the needs of various segments of the population. More specifically, it said that little was being done to serve youths whose socioeconomic and academic handicaps made it difficult to profit from regular programs. Consequently, the Declaration of Purpose of the Vocational Education Act of 1963 made it a responsibility to "develop new programs" not just for those in high school but also for those who had finished or dropped out of high school and were preparing to enter the labor force, those in the labor market who needed new skills or upgrading, and those with special educational handicaps.

Perhaps it is significant to note that while funds for remedial training and education went from virtually nothing in 1961 to almost \$2 billion in 1968, vocational education funds were going from \$50 million to \$250 million. However, of all the major legislation of the 1960's, only the Vocational Education Act of 1963 has as an immediate objective the reduction and ultimate prevention of a flow of untrained youth into the labor force. Unfortunately, for a number of reasons, with which you are familiar, including late funding, many authorities in the field concluded that the experience under the Act through 1968 showed little, if any, relationship to the resources which were added for new objectives.

While Congress showed some displeasure with this early experience, it reiterated its view that the preventive approach was better and that vocational education was the best way when it passed the 1968 Amendments to the 1963 Act. To be more specific, however, it earmarked 25 percent of the states' funds for the academic and socioeconomic handicapped and 10 percent for the physically and mentally handicapped. It dramatized this mandate by singling out the handicapped for special consideration in programs for those with special needs, residential schools, work-study programs, cooperative programs, training of vocational education personnel, curriculum development, exemplary programs, and consumer and homemaking education. While none of these were funded in 1969, and we may not know the full story for fiscal year 1970, it is clear that the 1968 Act is filled with challenges to serve the handicapped.

VOCATIONAL EDUCATION RESEARCH

In the midst of this web of frustration regarding the challenge to serve the handicapped, what has been the role of research? The 1962 panel, previously mentioned, complained of the lack of data and the need for research and evaluation. Consequently, for the first time in the history of vocational legislation, the 1963 ACT allocated federal funds for research and demonstration purposes. In fact, the legislation indicated that 10 percent of the funds should be for this purpose, and it especially emphasized the needs of the handicapped in the experimental and demonstration programs.

You are familiar with the fact that only \$39 million was actually spent in the broadly defined research category during the fiscal years 1965-1967, and only 50 percent of this for research per se. The 44 Research Coordinating Units, which were established during this period, had to share a total expenditure of approximately \$8 million with the two university research centers at Ohio State and North Carolina State. Consequently, from the standpoint of research potential during this period of time, those who shared the \$8 million could very well argue that it was too little and too late.

At any rate, the first Advisory Council, founded under the 1963 Act, felt that its work was seriously hampered by the lack of data. It felt that the reporting system was poorly designed, used inefficiently, and grossly inadequate. Most significant from the standpoint of the mandate to serve the handicapped was the statement that, beyond the demographic characteristics related to sex, there was nothing on age, race, education or family income. Garth Mangum in his book, Reorienting Vocational Education, summarizes some of the criticisms of research as "the lack of tangible impact on existing programs and on the development of new programs and methods."^{1/} Most especially, there was a feeling that results of research had not been interpreted in operational terms.

Part of this criticism resulted from the fact that the legal counsel of HEW did not allow funds to be spent for the dissemination of research and part as a result of the struggle over research funds among the Bureau of Research, The Bureau of Adult & Vocational Education and Library Services, and the states. Many, including The Bureau of Adult & Vocational Education, claimed that the funds dispensed by the Bureau of Research were concentrated on esoteric projects while operational problems were virtually excluded. Regardless of the validity of the many arguments, it is clear that it was difficult to meet the handicapped mandate due to data deficiencies.

However, those charged with a research mandate need not despair. Unpublished Office of Education studies of the last four or five years indicate that 17 percent of the white high school students participate in vocational education courses compared to 22 percent of the Black, 25 percent of the Oriental, and 36 percent of the American Indian students. Further, 80 percent of vocational education graduates come from families of below average socioeconomic environments. Finally, 80 percent of the

¹Garth Mangum, Reorienting Vocational Education, Institute of Labor and Industrial Relations, University of Michigan-Wayne State, May 1968, pp. 15-16.

vocational education students were below average ability with 50 percent coming from the lowest ability quartile. Thus, since a description of a majority of the vocational students is also a description of our handicapped group, the raw data are already in vocational education programs. The challenge is to utilize these data in meaningful research which will contribute to the solution of problems of the handicapped.

RESEARCH & DEMONSTRATION EXPERIENCE OF OTHER AGENCIES

Assuming sufficient funding for the new programs of the handicapped and for related research, what are some of the trends and experiences of organizations which have been engaged in research related to the handicapped for a longer period of time? First, let us look at some of the more traditional physical and mental handicaps. The Vocational Rehabilitation Administration had more than 1,000 research and demonstration projects during the 1956-68 period. Further, there are 18 comprehensive research-oriented rehabilitation facilities, of which three are vocational-oriented training centers. All are at leading universities. However, even with longer research experience, there is still a shortage of data on characteristics of those served, cost of services, and long-range results.

Nevertheless, there is research and a great deal of demonstration devoted to ways in which individuals can be assisted to obtain and keep a job. In mental retardation, a manual has been produced which analyzes 131 jobs available to the retarded and the characteristics necessary to success in these jobs. Further, test batteries have been designed to enable prediction of job success. There has been experimentation with every conceivable kind of half-way house, and new devices have made computer programming for the blind possible, as well as the performing arts as a profession for the deaf.

Job simplification and redesign are now making it possible to train retarded workers as data processors, electronic component assemblers, bank clerks and offset press operators. One midwest state developed an intensive job preparation and placement program which makes it possible to place long-time institution residents as

nurses aides, housekeepers, and food service workers. In fact, today, nearly 5,000 mentally retarded work in 40 federal agencies and receive a higher percentage of outstanding performance ratings than any other group of government workers.

Vocational education has been involved in projects with vocational rehabilitation agencies. In Ohio, they have collaborated in a work adjustment and evaluation laboratory, where initially a half day is spent in a workshop environment and one-half in counseling and social adjustment training. In later phases, counseling and training were gradually stepped up. The trainee pay came from the vocational education work study program. In Kentucky, vocational education supplies a wide range of institutional and OJT in conjunction with the more traditional services of vocational rehabilitation. Some experimentation is done entirely without the benefit of vocational education agencies. For example, The University of Houston Center for Human Resources has worked with the Harris County Lighthouse for the Blind in developing and evaluating experimental training and education for the visually impaired. The training is for custodial and security guards, medical transcription, clerical and industrial skills. At the end of the first two years, more than 56 percent of the trainees had been placed with approximately two-thirds still on the job. Several had changed jobs, but there were as many cases of improvement as there were movements to lower jobs. In short, there is a wide range of experiences that the researcher in vocational education can utilize in meeting the challenge of serving the physically and mentally handicapped.

Turning to the academically and socioeconomically handicapped, the emphasis of manpower programs in recent years on the hard-core unemployed has provided a lot of valuable experience. It is a problem that one does not have to leave town in order to study. For example, our own recently completed study of black vs. white teenage

unemployment in Houston poverty areas indicated that 39 percent of the black youth were unemployed, compared to 16 percent for white. If one adds those who no longer bother to look, the percentage idle is 53 for black versus 27 for white. The problems of blacks were further dramatized by the fact that high school dropouts do about as well as those who finish school, that one-third of them had never heard of the Texas Employment Commission, and that one-third of the employers felt that the education of black youth was inferior to white youth.

This latter problem was studied in detail in school systems across the nation by James S. Coleman of Johns Hopkins University. This now famous study indicated that the single most important determinant of school achievement was family background. The major way to improve the achievement in school, according to the study, is to make sure that children of lower income families attend schools where a majority of the children are from middle class homes. The middle class child is supposedly unaffected as long as he is part of a substantial majority. Norfolk, Virginia, is now trying to integrate its schools in such a way as to match the recommendations of the Coleman report. This could have significance for vocational training of the academically handicapped in high schools.

Hundreds of thousands have been trained under MDTA, and this has given vocational educators practical experience with the hard-core. However, despite the years of experience of some agencies involved with this program, we are generally short on data. Up to the present time, we do not have full follow-up of MDTA completions. For example, in a major city, in a study we are conducting, we find that there is no record of what happened to 50 percent of those completing MDTA this past year; that is, we do not know if they were ever placed in a job.

We know more about the hundreds of experimental and demonstration projects of the Department of Labor. Even here, it has been a real struggle to disseminate the results of projects, and it was finally necessary to develop a dissemination unit to assure more feedback and application. Recently, a study was made of 55 of the experimental and demonstration projects which were relevant in school-to-work transition. The common findings related to the disadvantaged which may have application to vocational education are:

1. Low educational attainment has led to the inclusion of basic education in almost all projects with the disadvantaged. However, it is found that for those with less than sixth grade performance, it is doubtful if basic education can aid in getting more than a menial job.
2. Even those put through a long, drawn-out ordeal generally prove to be job motivated and to have standard attitudes and expectations.
3. If training is too long, the setting and atmosphere may be so warm and pleasant that the trainee will prefer it to the real world. But a two week orientation may be far too short. Individual analysis is necessary.
4. Work sample testing originally developed by sheltered workshops for physically and mentally disabled has not been substituted for written tests for disadvantaged youth. The tests also show skills, ability to take direction and get along with fellow workers, punctuality, and give the student a better insight of himself.
5. Finally, it is argued that crisis counseling and direction aimed at symptoms rather than causes are better than standard in-depth psychiatrically-oriented counseling. Further, it is claimed that a combination of crisis counseling and world-of-work perceptions of in-school youth has been of most benefit in making school-to-work transitions.

Our own research in the poverty areas of Houston has indicated the need for and value of intensified counseling. Further, it is clear that not only do special approaches pay great dividends for in-school youth, but the same is true of inmates in prisons. Programs that we have studied have had amazing results, and the demand for vocational training by prison inmates is increasing. Finally, an investigation by our Center of reform schools in the state indicated the need for quality vocational training and special approaches, which should be possible under the 1968 amendments.

There is a research division of the U. S. Department of Labor which has turned out hundreds of studies in recent years. While it is supposedly mission oriented with an emphasis on application of findings in shaping legislation, policy, and program innovations, some difficulty is experienced in fitting many of the studies into this category. Regional and local studies are generally rejected as being in the domain of Employment Security, but there are few, if any, research funds in this agency. Even some of the regional research centers are not particularly regionally or program-policy oriented. While it probably is true that the research division does not have enough funds for national and esoteric studies, it has virtually all there is in the Department of Labor. Consequently, there is a real need for a better balance between national and regional-local studies on the one hand, and esoteric and program-policy studies on the other. Thus, it appears that in many government agencies, as well as on college campuses, esoterics is equated with academic acceptability. It seems to me that there is a real opportunity for research coordinating units to breach the gap left by this view.

VOCATIONAL EDUCATION RESEARCH PRIORITIES

There is such a need for data and for the data to be used in mission-oriented research which can be applied in the development of program and policy, that almost anything will aid in breaching the gap. Put very simply, the need is to collate,

investigate, evaluate and disseminate. To collate is merely to bring together all the data on what is going on in all the programs and the development of a reporting system that is fully responsive to the objectives of legislation. If we can only collect complete demographic data on all students in all programs by group served and include such items as race, age, and family income, we will have come a long way. In addition, we need to know the amount of time spent in vocational education per student, how many drop out, the completions, placement, and which placements were training related. Somehow, the RCU's need to guarantee that basic data will be collected, especially that related to the handicapped.

By investigating, the door is open to a wide range of research related to the overall approach of vocational education, policy and planning needs, and the role of supportive services in improving programs, to name a few areas. For example, in regard to the approach, it has been suggested that building an academic package around a core of practical skills, plus work experience provided by cooperative employers, is the ultimate in relevance for those from deprived backgrounds. Is it? Or when do we concentrate on remedial approaches rather than preventive? Do we know enough about the world-of-work orientation to know how it fits into vocational education and at which grade level?

When we turn to planning and policy development, we can ask a lot of questions. For example, what is the supply and demand for labor by occupation in your state or local area for the next several years? What are the implications for vocational education? This work does not have to be left to the labor economist, and it is impossible to really plan without it. Further, what is the supply and demand and training needs for personnel who can train the handicapped? Can we train the handicapped for this role? What is the proper coordination role for vocational education in regard to other manpower-related agencies and programs, especially as it relates

to serving the handicapped? Is there a role for the private school in serving the handicapped? Would it be fruitful to develop an exchange program between vocational educators and personnel and training executives of industries that hire a substantial number of handicapped? Can the distributive education program be used as an instrument to increase the placement of the disadvantaged in white collar jobs, or is there a better way?

In regard to supportive services for the handicapped, there are many questions relating to the role of guidance, counseling, orientation and placement assistance, and day care facilities. For example, I interviewed all of the trainees of the first training program to be approved under ARA and followed them for more than a year after completion. My conclusion was that they received so much orientation and placement assistance that they would have succeeded if they had received no training at all. Others have made similar conclusions. So what is the proper mix? Further interesting questions might relate to when residential facilities are needed for the handicapped and what are the differences between rural and urban, male and female, and can any of the lessons learned by the Job Corps be applied here? A final intriguing possibility is to investigate ways in which the newly oriented consumer and homemaking program might be tied to the training of female vocational students or to the wives of male students. Clearly, the possibilities are limitless.

It goes without saying that, to assure constant improvement, there must be a provision for constant evaluation and reporting of problems and accomplishments. In fact, it does not seem amiss to suggest that the RCU's should be responsible for the followup of a sample of graduates, with the full range of handicaps and from all programs, at one, five and ten year intervals. All the data collected and used in reporting, as well as the myriad of studies, experiments and demonstrations, provide more than ample opportunity for evaluation of services to and programs for the

handicapped. This can contribute greatly to an assurance that programs will be tied to objectives.

Finally, as we all know, the aforementioned suggestions and efforts will be entirely wasted unless there is a formal program of dissemination. Thus, in all of the above ways, I see the Research Coordinating Units as having the major burden to collate, investigate, evaluate and disseminate. My observations have been that your units are more than most, concerned with real problems in the real world. While there is always some value in pure research, and perhaps some in esoterics, we are so far behind in data collection and applied research that there is room for little else. This means, I think, that you must go into the field, become action oriented, and concern yourselves with programs and policy. In this way you can become a molder of vocational education opinion, not because of verbose pontification but because of a genuine concern for and attention to the real problems of the handicapped in America. At that time, the words which Teddy Roosevelt uttered so many years ago will become apropos to you:

It is not the critic who counts, not the man who points out how the strong man stumbled, or where the doer of deeds could have done them better. The credit belongs to the man who is actually in the arena, whose face is marred by dust and sweat and blood, who strives valiantly, who errs and comes up short again and again, who knows the great enthusiasms, the great devotions and spends himself in a worthy cause, who at the best knows in the end the triumphs of high achievement, and who at the worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and timid souls who know neither defeat nor victory.